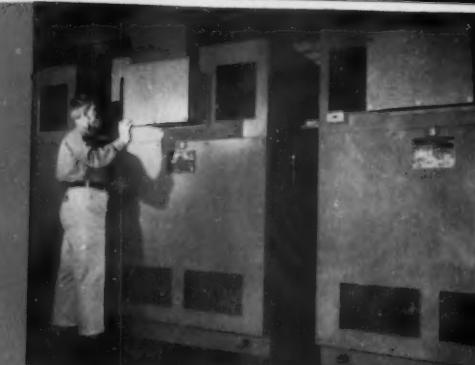


MARCH 1954

PRICE 35 CENTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING



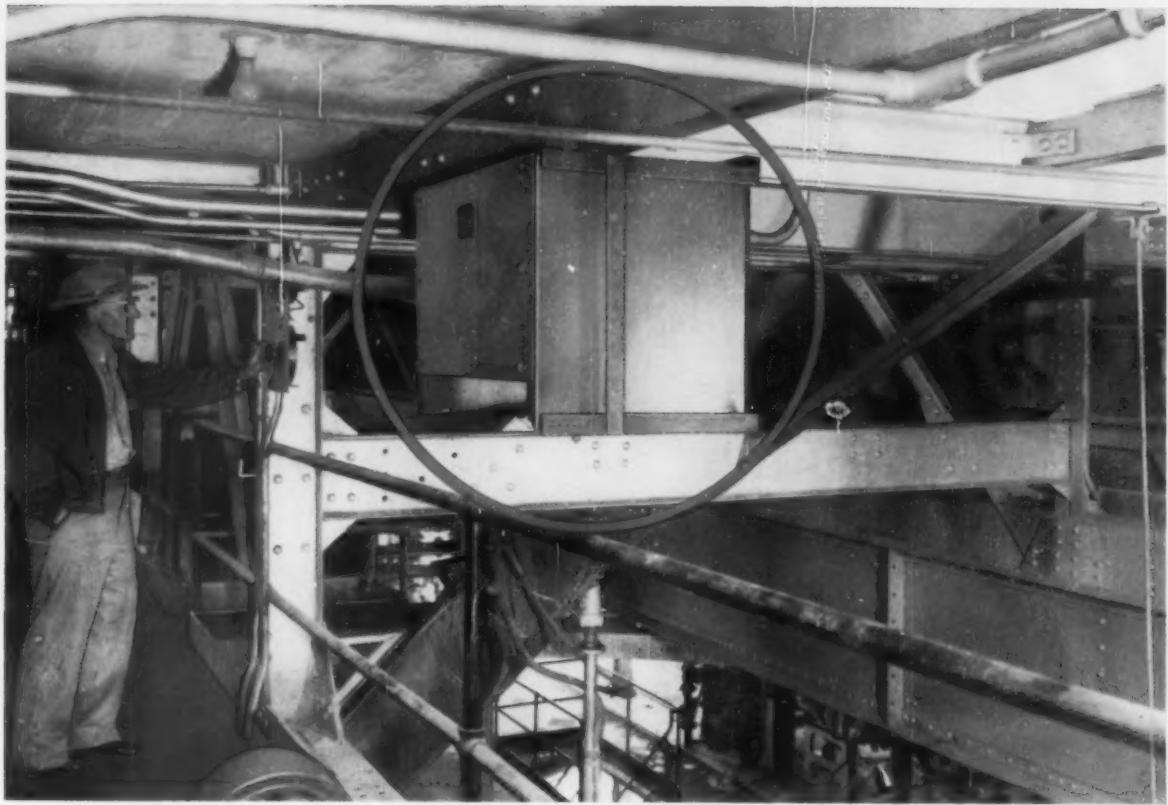
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see page 92

A McGRAW-HILL PUBLICATION

53RD YEAR



60-kvar capacitor unit shown above is part of the 600-kvar installation that permitted a 10% increase in load.

Capacitors can be put in out-of-the-way places—such as on these existing horizontal I-beams to conserve space.

Seriously overloaded circuits take on 10% more load after G-E Capacitors are added

American Crystal Sugar Co. profits from an emergency that arose during a recent sugar refining "campaign."

During a sugar beet "campaign" which lasts from July to December, the American Crystal Sugar Company of Clarksburg, California, operates 24 hours a day. Shutdowns mean costly financial losses.

That's why the company really had an emergency on its hands when its electrical facilities became seriously overloaded in a recent campaign. However, the solution was simple. A call to G.E. brought 600 kvar of capacitors to the

plant in time to prevent a "burnout."

A short time after the order was placed, the capacitors were installed and in operation. The plant's power factor climbed from 86% to about 97%. This relieved the overloading—and released enough capacity to handle a subsequent 10% increase in load!

CAPACITORS HAVE MANY USES
They can often free distribution facilities to carry 20 to 30% more load.

Where voltage drop is a problem, capacitors can provide the needed voltage boost inexpensively. And if your power factor is below 85%, and you have a power-factor or kva-demand clause in your contract, they can usually cut your power costs.

For more information, see your local G-E Apparatus sales office, or authorized G-E agent or distributor. Or write to Section 407-209 for booklet GEA-5632—"How to Reduce Power Costs and Gain System Capacity." *General Electric Company, Schenectady 5, New York.*

You can put your confidence in—
GENERAL ELECTRIC

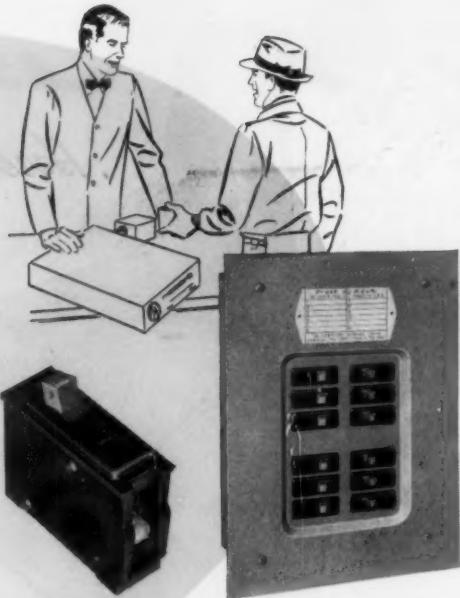


now available

from  distributor's
stocks for quick
assembly on the job



T-M thermal-magnetic
trip circuit breaker



LOAD CENTERS and SERVICE EQUIPMENT

Approved by the Underwriters' Laboratories, Inc., for label service, these new  assemblies embody many features that should make them extremely popular with contractors, and builders, as well as ultimate users.

Besides providing safe, dependable, automatic circuit protection against short circuits and harmless and dangerous overloads, these new units are so designed to make the addition of new circuits, changes in capacities and replacement of damaged units a simple, easy task.

Deliveries, too, are facilitated due to the fact that the new units are of the "panel base assembly" type, which means that all components — box, front, panel-back, bus bar and main lug connection — are available in one complete package from  distributor's stocks for quick and easy assembly on the job.

An outstanding feature of the new unit is the new  T-M Thermal-Magnetic Trip Circuit Breaker with quick-make and quick-break operation on manual or automatic trip and  design magnetic blow-out.

The thermal magnetic action of the circuit breaker automatically trips the handle, indicating the circuit in trouble. Service interruptions caused by harmless, momentary overloads are eliminated, due to the time-lag action of the circuit breaker's thermal element.

On short circuits and dangerous overloads, the magnetic trip hastens the action of the circuit

breaker. Once the cause of the trouble is removed, service is restored by flipping the handle back to "off" position and then to "on".

Screwless assembly (just slip the breakers in), one pressure type of connection between circuit breaker and bus bar, and "sequence bussing" to balance the load and permit double pole, individual trip combinations are other features.

Four basic combinations to afford a maximum of 4, 8, 12 and 20 poles (all single pole on combinations of single and double pole) are available. These, plus a supply of dependable, individually-packed single and double pole individual trip  type T-M Circuit Breakers, available from distributor's shelves, meet almost any job requirement.

For contractors and builders, these new  assemblies all add up to greater convenience, faster deliveries, and quick and easy installation on the job. So include these units on all jobs requiring Load Centers and Service Equipment. For further details, see your nearest  distributor, or contact a  representative, listed in Sweet's.

 ** T-M Circuit Breakers** are available in the following capacities: 10, 15, 20 and 30 amps., 120 volts AC single pole and/or 120/208 volts AC double pole individual trip; 40 and 50 amp., capacity furnished with  QP Quicklag P Circuit Breaker; main lugs for 100 amp., maximum, 115/230 volts, 3-wire single phase of 120/208 volts, 4-wire three phase mains. (Six circuits or less suitable for service equipment.)

*Frank Adam
Electric Co.*

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ST. LOUIS, MISSOURI

Makers of: BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER



INTENSO... the Brilliant light WITH THE MOST WANTED FEATURES

EXCLUSIVE "STRAIGHT-THRU" PEEP SIGHT

Remove protecting cap . . . aim right through center of lamp which stays in reflector. Bull's eye on lens gives rifle-like accuracy. Simple...quick!

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IMPERMEATED ASBESTOS GASKET

Assures positive weather-tight seal. Locked in place with 360° equalized pressure by rear lid clamps which are opened or closed in seconds.

LOCKING DEGREE INDICATORS

Give 1° calibration for 360° horizontal and 100° vertical positioning. Sturdy locking device maintains established position.

HEAVY GAUGE STEEL YOKE

Supports fixture firmly. Won't bend, buckle, or tear loose even in high winds. Gives ample clearance for easy cleaning and easy re-lamping.

HEAT AND IMPACT-RESISTING LENS

Heavy crystal-clear glass. Withstands shock and severe climatic changes. Tightly sealed across reflector mouth. Has "bull's-eye" trued up with peep sight.

Sold Nationally Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY
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Explosion-
Proof
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Malleable Iron
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Outlet Boxes

FLIPS wide open for EASY MAINTENANCE

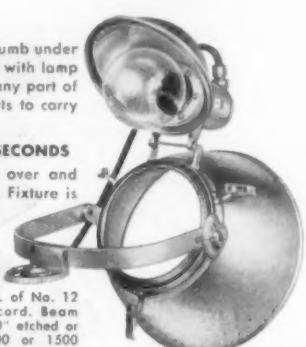
No tools needed. Simply slip thumb under 3 clamps . . . push . . . rear lid with lamp opens wide for easy access to any part of fixture. No screws or small parts to carry or lose.

SEALED AND LOCKED IN SECONDS

Servicing done? Flip rear lid over and down . . . clamp . . . that's all. Fixture is locked and weather-sealed with equalized pressure all around impregnated asbestos gasket. Seconds does the job!

Each floodlight complete with 4 ft. of No. 12 two-conductor rubber covered cord. Beam spreads: 20° to 90° in 18" and 20" etched or polished reflectors. Take 750-1000 or 1500 Watt PS-52 lamps.

Rely on APPLETION... The Standard for Better Lighting



Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

ELECTRICAL CONSTRUCTION AND MAINTENANCE

with which is consolidated Electrical Contracting, The Electrogist and Electrical Record . . . Established 1901

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March 1954

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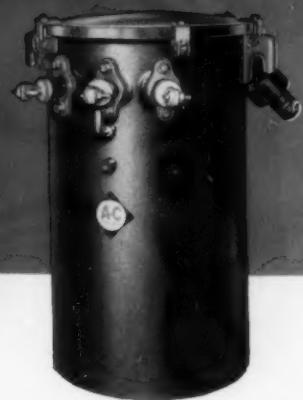
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New! HOT SPRAY PAINT PROCESS

Improves
Transformer
Finish

ALLIS-CHALMERS
DISTRIBUTION
TRANSFORMERS



A new Hot Spray System now used by Allis-Chalmers effectively substitutes heat for solvents in painting, to produce a higher quality finish than conventional spray processes. A smoother surface is achieved with a uniform coating that offers greater resistance to contamination and corrosive action. Pole type distribution transformers in ratings through 50 kva get this new surface treatment.

Paint Heated to 160 F

The fact that cold paint is thicker than paint kept at normal room temperature is widely recognized — cold paint takes more solvent to make it flow and atomize. In the new Allis-Chalmers hot spray process, alkyd-resinous paint is heated to 160 F. Only 15% solvent is required, compared to the 40% solvent needed in conventional spraying at normal temperatures. Since

there is far less solvent to evaporate, shrinkage after the paint is applied is greatly reduced. And better filling properties, brought about by improved flow and atomization, result in a smoother surface with greater gloss and excellent coverage.

Tests Prove Value

Tests conducted at Allis-Chalmers and at the Sub-Tropical Testing Laboratories at Miami, Florida show conclusively that tanks first cleansed and treated by Spray-Bonderizing and then Hot Spray painted have a superior protective surface. Test conditions included salt spray, humidity and sunlight as well as industrial atmosphere.

For more information on Allis-Chalmers new hot spray system as applied to distribution transformers, contact your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4201

ALLIS-CHALMERS



NOW...A CONVENTIONAL 2-POLE

Another I-T-E "first" featuring...



Actual Size

Available **NOW** in ratings from:

10 to 50 amperes

120/240 volts a-c

5,000 amperes interrupting capacity

Approved by
Underwriters' Laboratories, Inc.

- ▶ *True common-trip operation*
- ▶ *Unit design and construction*
- ▶ *Single handle visually indicating 3 positions*

Here's the latest advancement in circuit protection—a genuine, conventional 2-pole EQ circuit breaker! No longer must you depend on makeshift handle tie-bars or questionable simultaneous pole-opening arrangements. The new I-T-E breaker is *specifically designed* for 2-pole *common-trip* operation.

Designed and built to include all the standard, proved I-T-E *extra-quality* features, the new 2-pole EQ breaker can be incorporated in conventional panelboards, load centers, and individual enclosures. The breaker occupies exactly twice the space of the single-pole design.

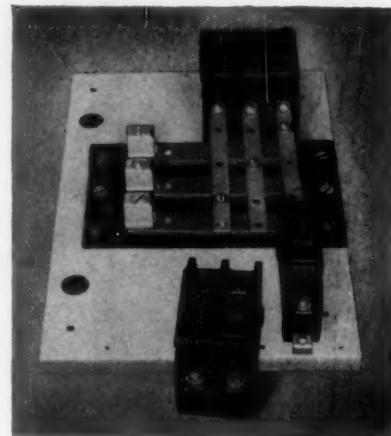
What's more, where service voltage does not exceed 120/240 volts, a-c, the new 2-pole common trip EQ circuit breaker provides a space-saving premium.



50-AMPERE CIRCUIT BREAKER!

Same pole spacing

New 2-pole EQ circuit breaker occupies exactly twice the space of present single-pole design. New 2-pole breaker fits all existing panelboard and load center designs in which single pole EQ type breakers are now used. No tie-bar arrangements are necessary; both poles operate on common trip principle.



All these I-T-E extra-quality features

3-POSITION OPERATING HANDLE

clearly indicates whether breaker is ON, TRIPPED, or OFF. Service quickly restored.

STURDY MOLDED CASE

completely encloses operating mechanism. Safe, rugged, tamper-proof.

QUICK-MAKE, QUICK-BREAK ACTION

on both manual and electrical operation preserves contact life.

EFFICIENT MAGNETIC ARC CHUTES

extinguish arc instantaneously... provide high interrupting capacity.

PLATED METAL PARTS.

An extra-quality feature that protects internal mechanism against corrosion.

SINGLE UNIT DESIGN.

Not two separate single-pole breakers joined together.

TRIP-FREE TOGGLE ACTION

makes it impossible to hold breaker closed against an overload.

PRESSURE WIRE CONNECTORS

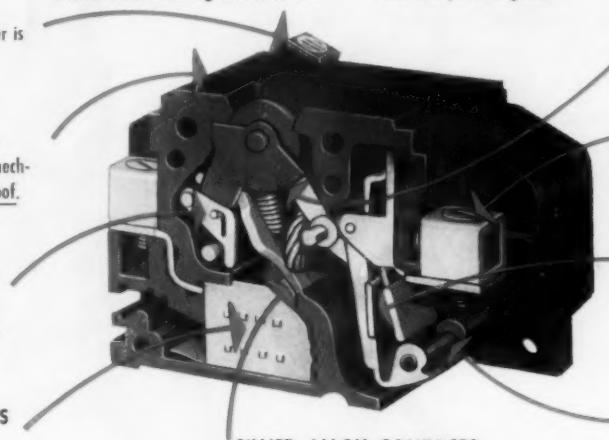
are securely mounted—easily accessible for quick connection of leads.

THERMAL-MAGNETIC TRIPPING

provides dual protection against (1) overloads and (2) short circuits.

COMMON TRIPPER BAR

opens both poles simultaneously. Eliminates handle tie-bars... allows use of proved "common-trip" principle.



Save time, save space... without sacrificing quality

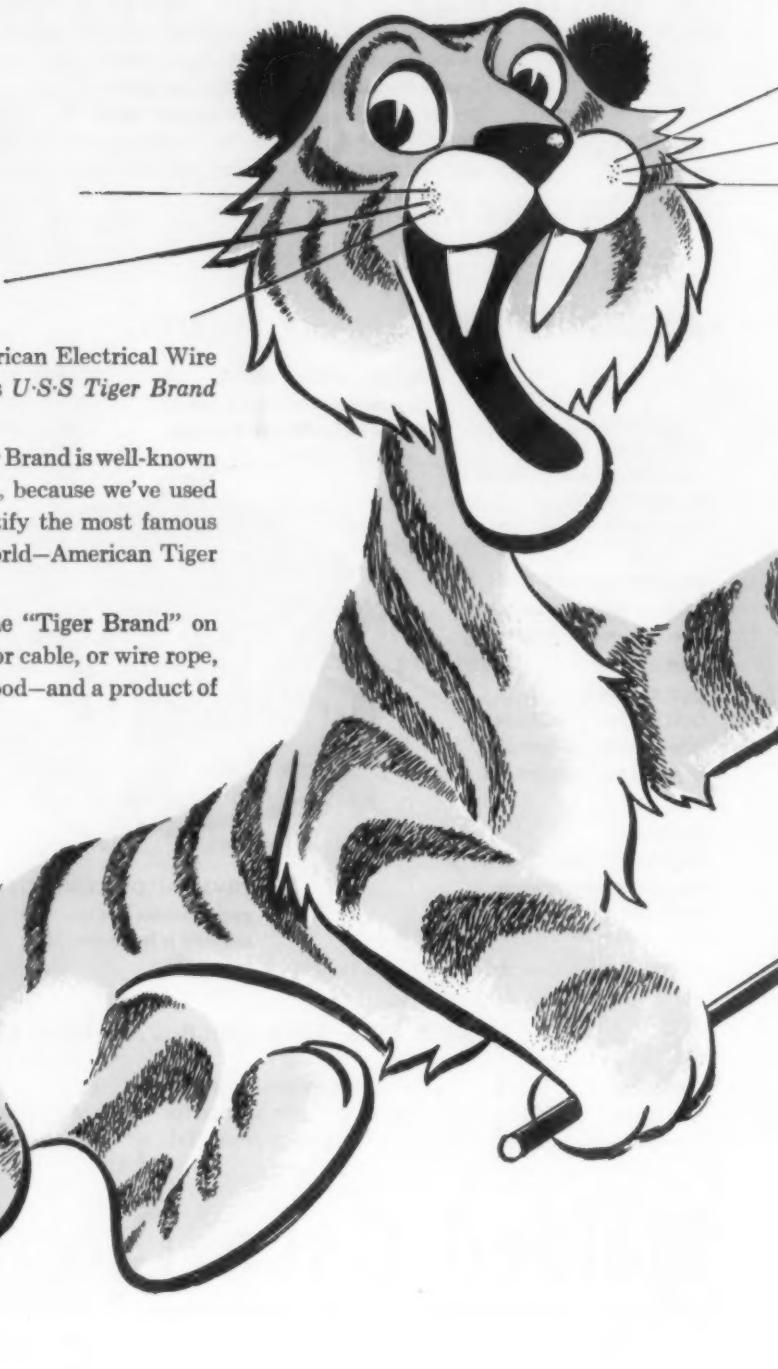
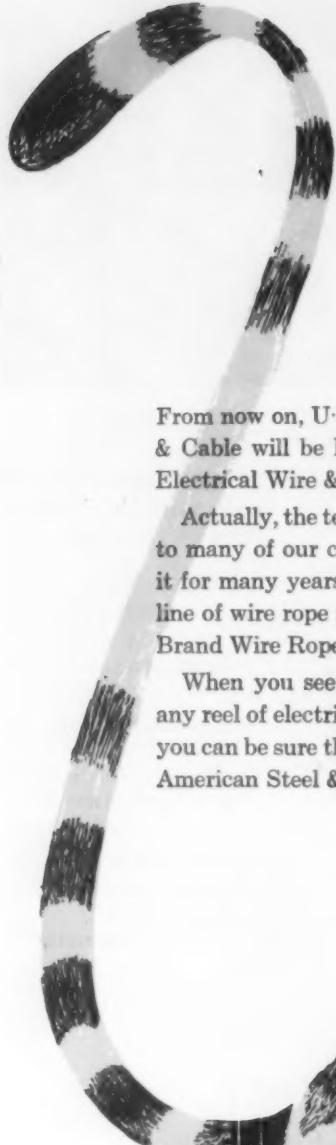
Standardize on I-T-E circuit breakers to assure service continuity, simplified maintenance, a single source for system expansion, and—always—the same proved I-T-E

feature of true dependability throughout.

For details, write to I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia 30, Pa.

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a brand new name for a famous old



From now on, U·S·S American Electrical Wire & Cable will be known as *U·S·S Tiger Brand* Electrical Wire & Cable.

Actually, the term *Tiger Brand* is well-known to many of our customers, because we've used it for many years to identify the most famous line of wire rope in the world—American Tiger Brand Wire Rope.

When you see the name "Tiger Brand" on any reel of electrical wire or cable, or wire rope, you can be sure that it's good—and a product of American Steel & Wire.

line of wire and cable



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UNITED STATES STEEL

Presto... it's UP!

17 ft.

"UP-RIGHT"

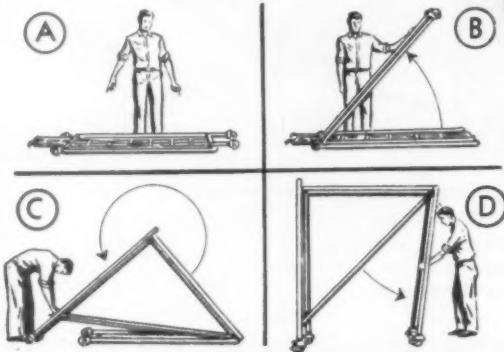
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3 minutes!*

As if by magic, an aluminum alloy tower of any height desired is ready in minutes! Individual scaffold sections are set one on top of the other. Sections lock into place instantly.

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says Fred L. Baumeister
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Snow, slush, and rain call for galoshes. You might catch pneumonia if you leave them home. Your power cables need galoshes, too. They can't catch pneumonia, but if they get wet enough they'll eventually need expensive doctoring. • Simplex-ANHYDREX Cable has those galoshes. They're built-in in the form of Anhydrex insulation. Anhydrex insulation is guaranteed not to absorb more than 20 milligrams of distilled water per square inch after 7 days' immersion in 158° F. (70° C.) water. It is the most stable rubber insulation when exposed to water and moisture. • Besides its notable low water-absorption characteristics, Simplex-ANHYDREX Cable is unaffected by summer heat and winter cold. It won't crack under vibration and is highly resistant to acids, flame, grease, and oil. • Your Simplex representative has more information about the cable with "the built-in galoshes" — Simplex-ANHYDREX Cable. Ask him about it.

Simplex-ANHYDREX
SIMPLEX WIRE & CABLE COMPANY
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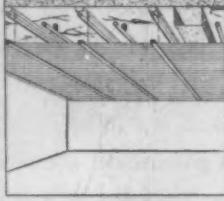


PROVIDES CORRECT ILLUMINATION



Acusti-Luminous Ceiling is both efficient and easy on the eyes. Foot-candles may be regulated by varying the number of fluorescent lights above Lumi-Plastic ceiling. The source of light is not perceptible—thus creating a "luminous environment" for minimum eye strain and maximum working efficiency.

MODERNIZES OLD CEILINGS



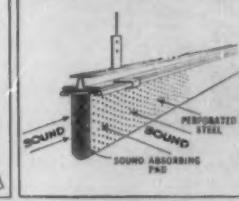
New lowered ceiling hides pipes, sprinklers, ducts, cracks. This gives ceiling clean, modern lines. Not only are these old eye-sores hidden, but the Acusti-Luminous Ceiling makes a readily accessible cover for the pipes, ducts, and valves. To get to any of these, the plastic is simply rolled up like a blind.

SAVES ON MAINTENANCE



Rolls easily for washing and relamping. And light is so evenly diffused up to 20% of lamps may burn out before dark spots are noticeable. Thus, all lamps may be replaced at once. While plastic is down, it can be washed and destaticized in a detergent or by a specially furnished machine for only 1¢ to 3¢ a sq. ft.

ABSORBS SOUND ECONOMICALLY



Acusti-Louvers absorb sound, also louver out the view of ceiling. Clip-on acoustical baffles can be added or subtracted as requirements in an area vary to meet any acoustical need. Their cost is far less. Lumi-Plastic is "transparent" to sound so that any existing acoustical material above it still functions.

SAVES ON INSTALLATION



Installation is clean and simple. No special skill is required for simple and rapid assembly of these lightweight units. The product is self-spacing, rigid, and fool-proof. Complete shop drawings and instructions are included. Acusti-Luminous engineering staff is available in major cities for consultation.

MADE BY THE NATION'S LEADING PRODUCER OF LUMINOUS CEILINGS—

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PHONE: ARMITAGE 6-2800

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SALT LAKE CITY

Acusti-luminous ceilings

...a Light for Indoors
Actually Superior to Daylight!

Modern "Ceiling of Light" Puts Profit Back in Lighting!

Here's the two-in-one ceiling that gives you two profits on every job!

First—An Acusti-Luminous Ceiling provides an ideal LIGHT! The unbreakable corrugated Lumi-Plastic evenly diffuses the light, so there is no shadow and no glare—with low brightness of any intensity!

Second—It's a beautiful modern CEILING—an acoustically corrected ceiling—with noise-absorbing Acusti-Louvres which may be hung below the Lumi-Plastic. Perfect for either remodeling or new construction.

So double your dollar volume by installing Acusti-Luminous Ceilings! Make your usual profit on lighting fixtures—plus a "bonus" profit on an acoustical ceiling!

Installation is so quick and easy! These lightweight units are simple to install in a minimum number of man-hours.

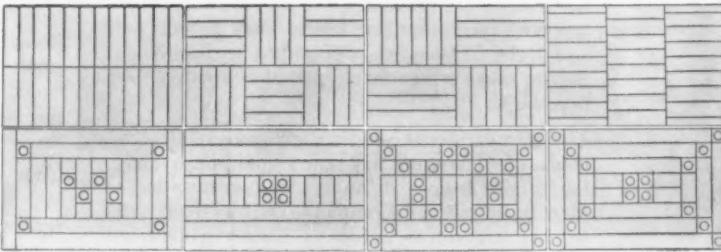
The cost is low—less than conventional ceilings with the same illumination and sound correction.

This is a "package" installation. Sold only on engineered quote. Full protection to originator assured. You get a complete package—designed and guaranteed by the oldest company in the field. Write or call today.

**LABELED BY
UNDERWRITERS'
LABORATORIES** Acusti-Luminous Ceilings are UL labeled for use under sprinkler systems—without any change in fire insurance rates. In event of fire, the plastic (which does not support combustion) softens and falls to the floor so sprinklers function normally.

unlimited designs possible with Acusti-Luminous Ceilings

Simple construction allows the creation of varied designs. Modules of 3 feet make up the design. Spotlight sections may be inserted to emphasize displays and merchandise areas.



send for FREE BOOKLET!



For complete information, send for your copy of this fact-filled, illustrated booklet. It contains photographs of major installations across country, easy steps for layout, and architectural diagrams. No obligation.

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ABOVE—Partial view of Acusti-Luminous Ceiling at J. A. Folger & Co., Kansas City, Mo., makers of Folger's Coffee, shows how former shipping room was remodeled to make this modern, efficient accounting department.

Contractor: Crescent Electric Co., Kansas City.

CVED 2800 INSTALLATIONS IN 36 STATES!

Below are a few of the many installations in factories, offices, drafting rooms, critical work areas, stores, banks, schools, libraries, and public buildings:

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American Airlines, Inc.
American Cyanamid Co.
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Ford Motor Co.
General Electric Co.
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Pacific Gas & Electric Co.
Sears, Roebuck & Co.
Standard Oil Co.
Union Carbide and Carbon Corp.
University of California
Western Electric Co., Inc.
Westinghouse Electric Corp.

LOS ANGELES
SAN FRANCISCO
SEATTLE
TULSA
MONTREAL, CANADA



150 kva, 80° Rise Wagner Dry-Type Transformer that feeds through control center for the automatic bakery's cooling room.

reduce power distribution costs with Wagner Dry-Type Transformers

You can save money, save copper, and improve voltage regulation by bringing the right voltage to the load center with Wagner Dry-Type Transformers. They are safe to use—without fireproof vaults or other special protection—even where fire hazards are present. They provide steady voltage with minimum line losses. They are compact and light in weight—economical to install and easy to move when changes in plant facilities are necessary.

The transformer shown in the photograph above is one of 45 Wagner dry-type transformers, ranging in size from 5 through 150 kva, installed at Mrs. Baird's Bread Company, Dallas, Texas—the world's largest fully automatic bakery. All motors,

lighting and equipment in the bakery are operated from the low voltage side of the Wagner Transformers that step down power delivered at 480 to 208Y/120 volts.

Wagner has a complete line of dry-type transformers that includes single-phase and three-phase units in ratings from 1 through 500 kva, single-phase and three-phase auto-transformers, and unit substation transformers 112½ through 2000 kva.

Your nearby Wagner engineer can help you select the *right* transformer for your needs. Just call the nearest of our 32 branch offices, or write us.



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T54-2

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INDUSTRIAL BRAKES
AUTOMOTIVE
BRAKE SYSTEMS—
AIR AND HYDRAULIC

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QUALITY plus STRENGTH
in the RIGHT
PLACES



Now!...
ANDERSON

High Tensile Bronze
DURA-LUGS*
IN A WIDER RANGE OF SIZES
and capacities

ANDERSON DURA-LUGS* are specifically designed to meet the demands for power connectors with current-carrying capacities *equal to that of each conductor used*. Joint resistance has been reduced to practically the vanishing point . . . and, their sturdier, more compact, simpler construction all combine to assure positive pressure and take full advantage of the current-carrying capacity of every strand in the cables. *Check these 4 points of superiority:*

1 DURA-LUG* design combines high tensile bronze for clamping members and high conductivity metal contact surfaces for greater current carrying characteristics.

This means:

A Minimum elongation in the cable opening to maintain clamping pressure.

B Withstands A.S.T.M. Mercurous Nitrate Test.

C Develops maximum "pull out."

2 They require no special tools to install.

3 Lockwasher provided to prevent loosening under vibration.

4 11 sizes provide the *right* capacity for each size of cable used.

Underwriters' approval on all catalog sizes to I.T.E. 050A

* Patent Applied For

FOR COMPLETE INFORMATION, CONSULT ONE OF OUR NEAREST
20 REPRESENTATIVES . . . OR CONTACT OUR MAIN OFFICE.

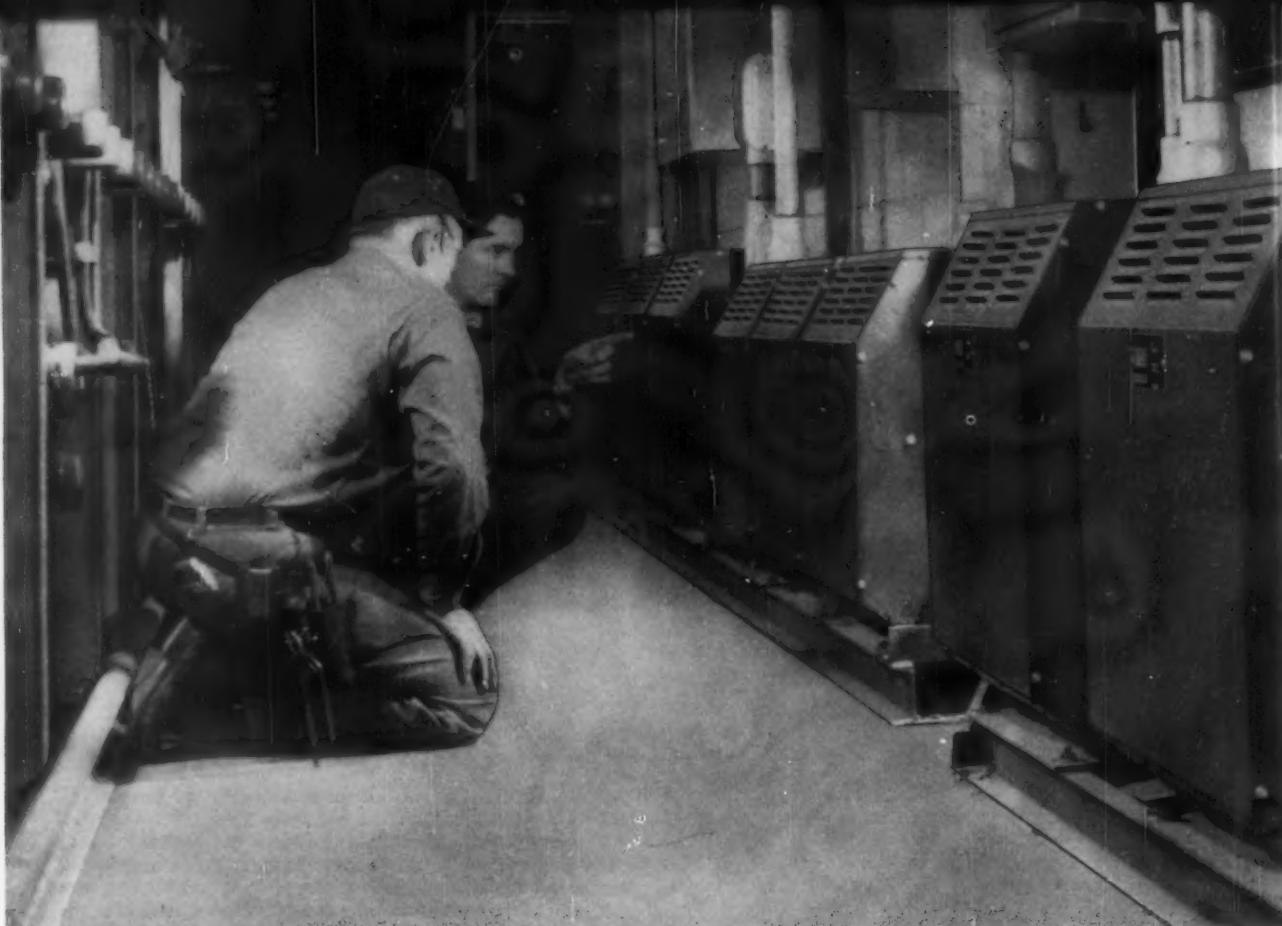
POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES
• TRANSMISSION • DISTRIBUTION



Aluminum & Bronze
for SUBSTATION

ANDERSON BRASS WORKS, INC.

P. O. DRAWER 2151 • BIRMINGHAM 1, ALABAMA



FORGING INDUSTRY application shows typical use of G-E dry-type transformers to change voltage at the load. These Type

D's serve heating elements of G-E Roller Hearth Electric Furnace at Fremont, Ohio, plant of Bingham-Herbrand Corporation.

G-E dry-type transformers cut power loss because they change voltage at the load

STRETCH YOUR POWER DOLLARS with G-E dry-type transformers; they can be installed where you need them—at the load. Efficient and economical, G-E dry-types eliminate long runs of costly secondary feeders, reduce wiring costs and cut line losses. That's the way they're helping cut power losses throughout industry. You can use them in your plant wherever machines, lighting or portable tools require voltage changes.

EASILY INSTALLED, G-E dry-types can be mounted out of the way on columns, wall brackets, or platforms. Large wiring compartments do away

with need for junction boxes, help reduce installation time.

QUIET IN OPERATION, G-E dry-type transformers are designed for efficient cooling and require virtually no maintenance. Type M's can be used indoors or out, are rated .25 through 15 kva. Type D's, for indoor use, are rated 25 kva and above.

GET FULL INFORMATION on how G-E dry-type transformers can help cut power losses in your plant. Call your nearest authorized G-E Distributor today. Or write for new bulletin, GED-2024 to Section 411-116, General Electric Co., Schenectady 5, N. Y.

You can put your confidence in—

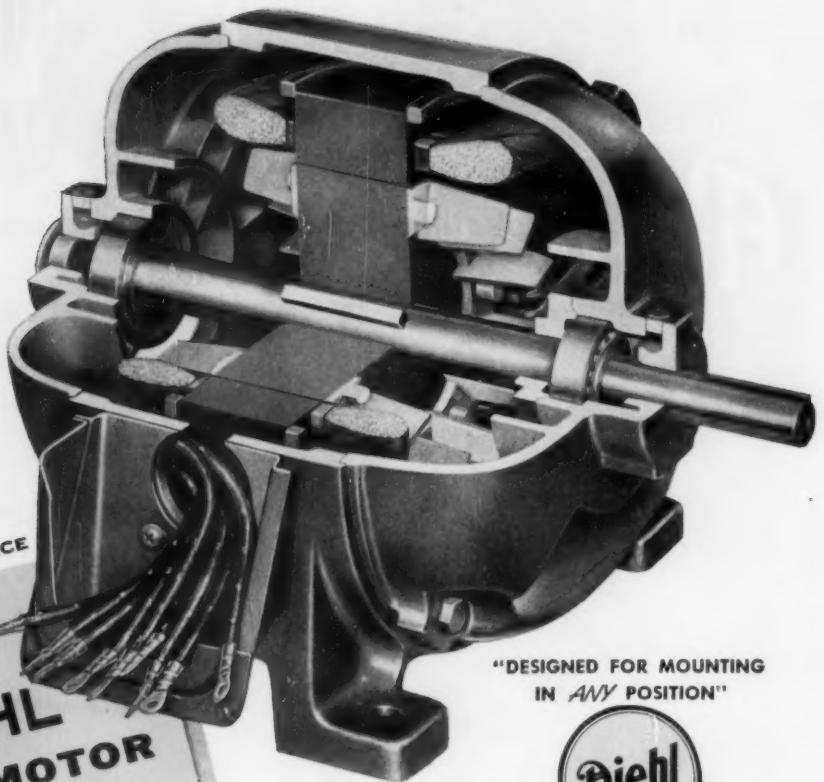
GENERAL ELECTRIC



EASY HANDLING is feature of G-E Type M's like this one in Multi-Slide Machine made by U.S. Tool Co., Ampere, N. J.

TOPS IN QUALITY
COMPETITIVE IN PRICE

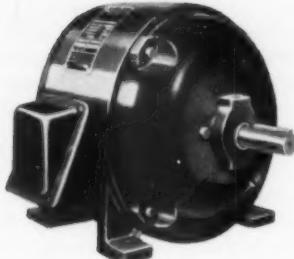
SPECIFY THE
New DIEHL
TYPE "D" MOTOR



"DESIGNED FOR MOUNTING
IN ANY POSITION"



...here's 12 reasons why



Designed and engineered for more efficient performance. Smaller in size, lighter in weight and quieter in operation.

Consult our engineers before writing your specifications and get the benefit of 68 years of experience in the design and manufacture of general and special purpose motors.

Diehl motors will still be available in old NEMA Standard frame sizes for interchange and replacement.

Most Advanced Slot Insulation
Machine Fitted Stator
Rotor Keyed to Shaft
New High Dielectric Insulated
Stator Windings
Permanently Numbered Leads
Conduit Box, An Electrician's Delight
Centrifugally Cast, High Density
Rotor Windings
Rugged Stress-Relieved End-Covers
New Pre-lubricated Heavy Duty
Ball Bearings
Locked-in Ball Bearing
Dual Ventilation System
Extra Strong Cast Iron Frame

DIEHL MANUFACTURING COMPANY
Electrical Division of THE SINGER MANUFACTURING COMPANY
Finderne Plant, SOMERVILLE, N. J.

Please send me the following bulletins

New Type "D" Motor Bulletin No. EC 3304
 Consolidated Catalog & Price List No. EC 3310

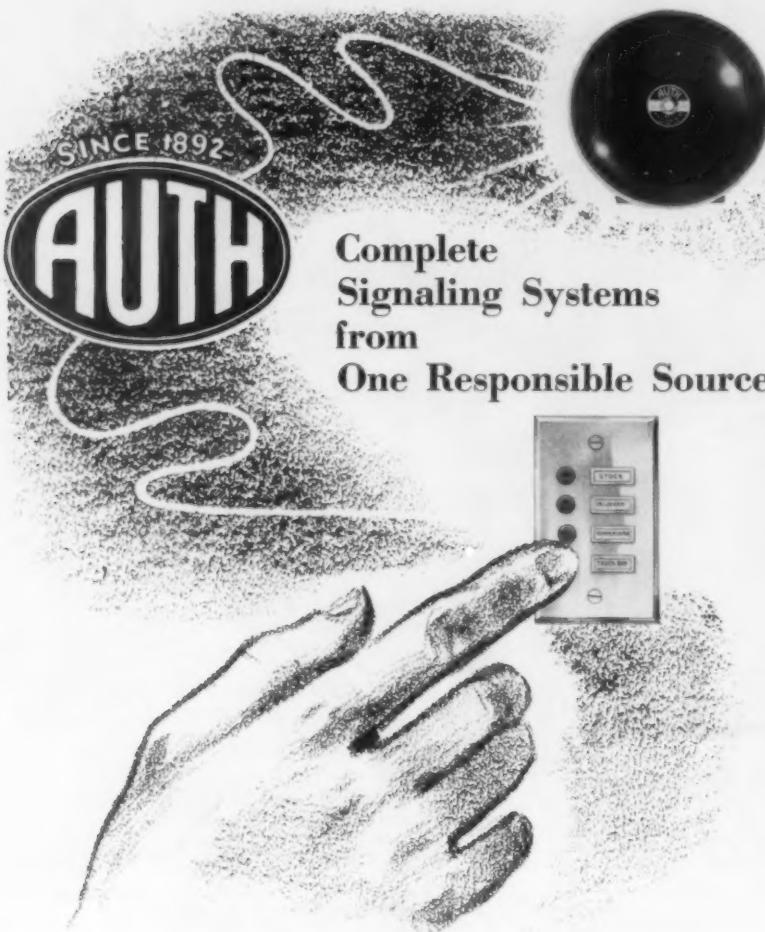
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Company _____

Street _____

City _____ State _____

INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES



**Complete
Signaling Systems
from
One Responsible Source**

Electrical signaling systems usually consist of a number of different components which, when electrically connected, form a complete operating system. For example, Clock and Program Bell Systems for schools often comprise a program time instrument, a central clock-resetting device, a manually-operated cross-connecting bell control board, indoor and outdoor audible signals such as bells, buzzers and horns, and dual-motored clocks of various styles. The Fire Alarm and Intercommunicating Telephone Systems for schools are just as diverse in their components.

Likewise, the signaling systems which comprise the nerve centers of hospitals, housing projects, industrial plants and commercial establishments all consist of many different components electrically connected to perform their necessary, and often vital, functions.

The importance of securing all components of a system from one responsible source is obvious. To the architect, engineer, distributor and electrical contractor it means the ability to specify, purchase and install with the utmost confidence and with a minimum of effort and expense. To the owner it means standardization of equipment with consequent ease of maintenance.

The Auth Electric Company has been a responsible manufacturer of signaling systems for many years. It supplies all the necessary components for the installation of complete systems; also, all required specification and engineering data. Your nearest Auth office will be glad to give you information on Auth Signaling Systems, or you may write directly to the **Auth Electric Company, Inc., 34-20 45th St., Long Island City 1, New York.**



FOREMOST IN THE DESIGN AND MANUFACTURE OF ELECTRICAL SIGNALING, COMMUNICATION, TIME, AND PROTECTIVE EQUIPMENT FOR SCHOOLS, HOSPITALS, HOUSING, OFFICES, SHIPS, AND INDUSTRY.



Complete Systems for Hospitals

Nurse's Call, Vokalcall (Audio-Visual), Doctors' In & Out, Doctors' Paging, Fire Alarm, Synchronous Clock, Intercom Telephone, and Return Call (For Nurses' Home). Also night lights.



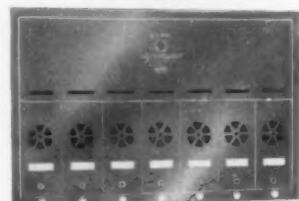
Complete Systems for Schools

Clock and Program Bell, Fire Alarm, Intercom Telephone, and Miscellaneous.



Complete Systems for Industry

Bell, Intercom Telephone, Fire Alarm, Annunciator, and Synchronous Clock.

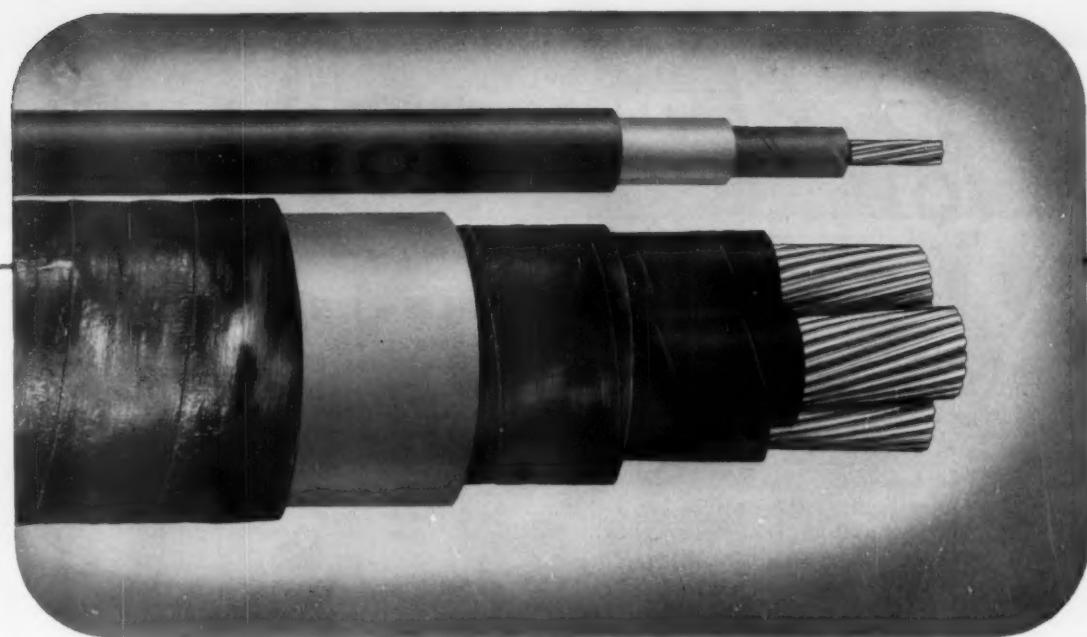


Complete Systems for Housing

Apartment Telephone and Flush Bell. Also Apartment Mail Boxes and Non-Electric Door Chimes.

ROEBLING PROTECTIVE COVERINGS ON LEAD SHEATHED CABLE

for utilities, chemical plants and the petroleum industry



LEAD SHEATHED CABLES used in certain applications by public and private utilities, chemical plants and the petroleum industry are often impaired by electrolysis or chemical corrosion. But such corrosive action can be effectively reduced, and cable life extended, by using Roebling Paper Insulated and Varnished Cambric Cables with either of two outer protective coverings.

One of these coverings is an extruded thermoplastic sheath employing a special high-molecular weight polyethylene. The other is ROESHEATH,

built up of neoprene and neoprene-filled fabric tapes and vulcanized directly over the lead sheath. Both coverings not only provide essential protection, but, in some cases, may permit the thickness of the lead sheath to be reduced.

For longer, more dependable cable life and worthwhile economy write for full information... and get our recommendations for solving any special problem.

John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

A subsidiary of The Colorado Fuel and Iron Corporation

ROEBLING

ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST &
5 PITTSBURGH ST • CHICAGO, 5225 W. ROOSEVELT RD
• CINCINNATI, 3255 FREDONIA AVE • CLEVELAND, 19225
LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON
ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216
NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR
BLD • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS,
1920 E. 2ND ST • PHILADELPHIA, 230
VINE ST • ROCHESTER, 1 FLINT ST. •
SAN FRANCISCO, 1740 17TH ST •
SEATTLE, 900 1ST AVE S. • ST.
LOUIS, 3001 DELMAR BLVD. •
TULSA, 321 N. CHEYENNE
ST • EXPORT SALES OFFICE,
TRENTON 2, NEW JERSEY



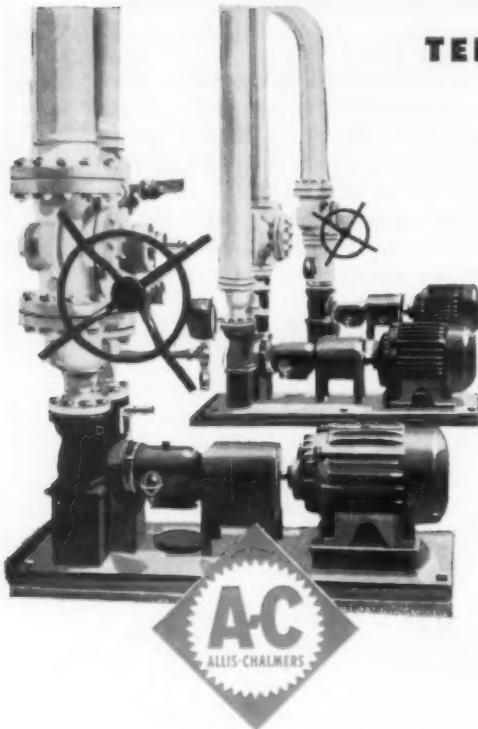
GREATER PROTECTION AGAINST FOREIGN MATTER—LONG

new motors - new

OPEN—DRIP-PROOF

Here are a few of the reasons why the new Allis-Chalmers open-drip-proof motor in NEMA rerate sizes will give you better performance and lower maintenance costs in general-purpose applications.

- Better protection against falling water and debris because cooling air inlets are on bottom.
- Long bearing life because large grease chambers provide plenty of reserve lubricant and are thoroughly sealed against foreign matter.
- Quieter operation, smoother performance.



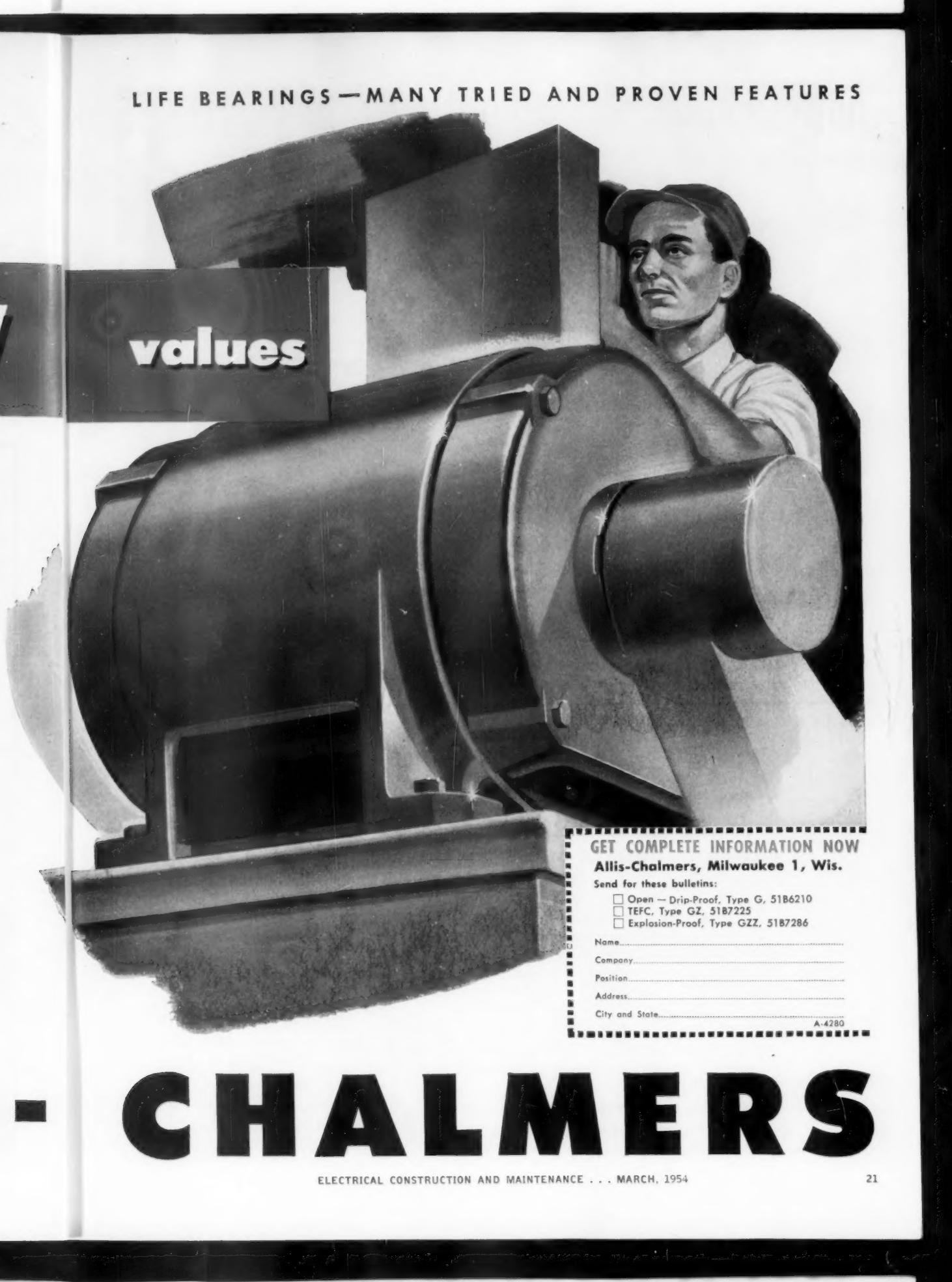
TEFC and EXPLOSION-PROOF

For especially dirty, corrosive or hazardous applications, you will get top performance with low maintenance costs from the new Allis-Chalmers totally-enclosed, fan-cooled and explosion-proof motors in NEMA rerate sizes. Here are a few of the reasons:

- Foreign matter kept out of bearings and motor interior by double labyrinth seals inside and outside of bearings, and long running fits between shaft and seals.
- Bearing maintenance reduced because large grease chambers provide space for reserve lubricant; also, if required, grease may be renewed without dismantling.
- Easy to clean — no inaccessible air passages. Dirt wipes or blows off easily.

ALLIS-

LIFE BEARINGS—MANY TRIED AND PROVEN FEATURES



values

GET COMPLETE INFORMATION NOW
Allis-Chalmers, Milwaukee 1, Wis.

Send for these bulletins:

- Open — Drip-Proof, Type G, 51B6210
- TEFC, Type GZ, 51B7225
- Explosion-Proof, Type GZZ, 51B7286

Name.....

Company.....

Position.....

Address.....

City and State.....

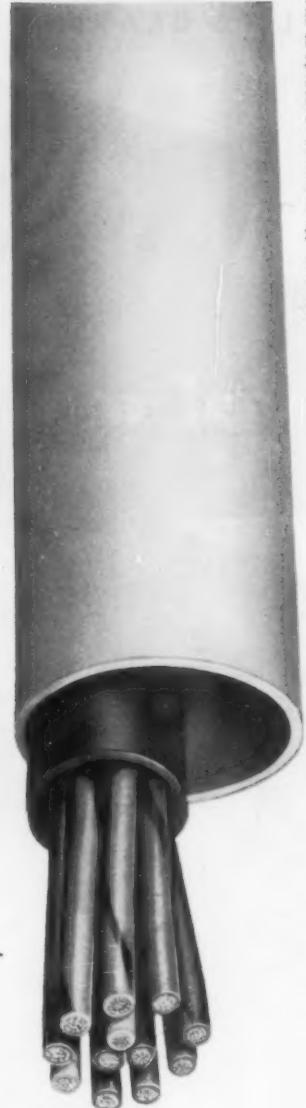
A-4280

· CHALMERS

CONVENTIONAL 7-CONDUCTOR #9 AWG IN 1½" CONDUIT.



ALMOST
DOUBLES
YOUR **CONDUIT**
CAPACITY



PNR 12-CONDUCTOR #9 AWG IN 1½" CONDUIT.

ROCKBESTOS PNR
SMALL DIAMETER CONTROL CABLE

PROPERTIES OF PNR

Here's a smaller, lighter control cable that saves you labor, conduit, fittings. Approximately 1/2 the size of conventional control cable, Rockbestos PNR lets you pull 12 conductors where before you had only 7.

Millions of feet are now in service. Get the full PNR story. Find out where it can save you time and money. Write today, or call in your nearest Rockbestos representative.

46% smaller in area . . . 28% smaller in diameter than conventional control cable. Use smaller conduit and fittings or put more conductors in existing conduit.

Lighter, easier to handle, store, ship, pull through conduit.

Dielectric breakdown . . . over 40 times operating voltage.

Rated 600 volts . . . conductor operating temperature 168°F.

Flexible from 168° to -67°F.
No cracking!

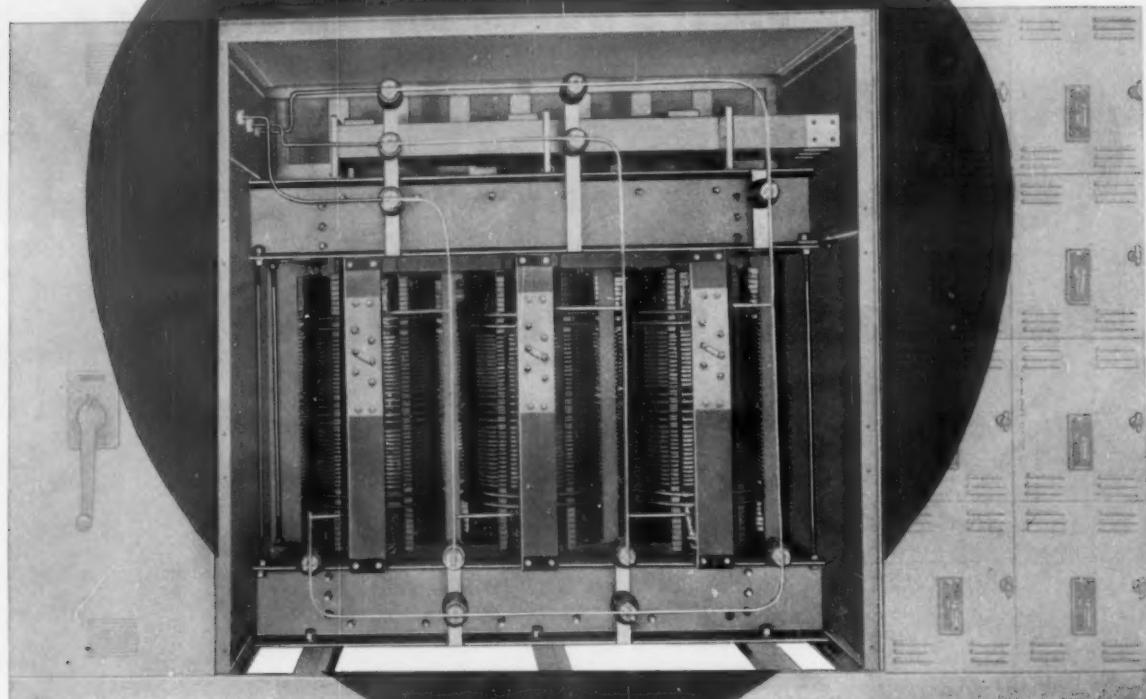
ROCKBESTOS PRODUCTS
NEW HAVEN 4, CONN.



CORPORATION

NEW YORK • CLEVELAND • DETROIT
CHICAGO • PITTSBURGH • ST. LOUIS
LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA • SEATTLE

The transformer is the heart of a substation



1000 Kva 13,200 volt Sorgel transformer in a substation (compartment panel removed)

A substation is no better than its transformer; therefore, it is important that the transformer is of the best quality—a Sorgel air-cooled dry-type transformer.

Dry-type transformers are the most practical type for indoor installations. They require little or no maintenance; no liquid to check or replenish; no fire hazard; small and compact; economical; easy and convenient to install; no vault required; can be placed close to load center, resulting in better voltage regulation, more efficient distribution and lower wiring cost. Easily moved when required for expansion or alterations.

Complete Line

for every purpose

1/4 Kva to 3000 Kva

All voltages

120 to 15,000 volts



Also

Special
Transformers

and

Saturable Reactors

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 836 West National Ave., Milwaukee 4, Wis.

Pioneers in the development, manufacturing and application of Air-Cooled Dry-Type Transformers — Nearly 40 years

SEE YOUR PHELPS DODGE DISTRIBUTOR FOR

Quality and Service

that help you get full job profit!

You can count on your Phelps Dodge distributor to give you prompt, helpful service on every electrical job. His wire and cable meet the highest quality standards, assure customer satisfaction right from the start. Better call the Phelps Dodge distributor in your city right now!





PHELPS DODGE COPPER PRODUCTS CORPORATION

WIRE BY PHELPS DODGE MEANS WIRED FOR LIFE!

ALL-PURPOSE INCANDESCENT DOWNLIGHTS

Designed to
PROVIDE MORE LIGHT
AT LOWER OVERALL FIXTURE COST
WITH HIGHER MAINTAINED EFFICIENCY

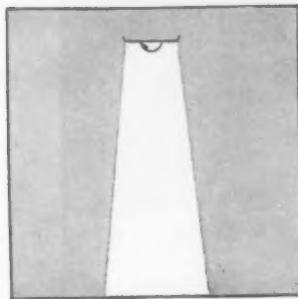
Silver-dot



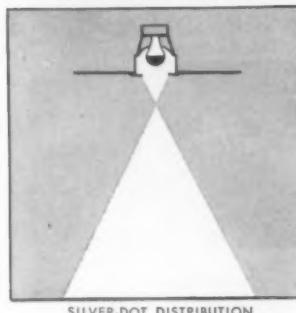
with...

BETTER GLARE CONTROL
EASIER RELAMPING
THAN ALL OTHER
RECESSED LIGHTING DEVICES

Silver-spot



SILVER-SPOT DISTRIBUTION



SILVER-DOT DISTRIBUTION

HERE ARE THE FACTS

MORE LIGHT

The Silver-spot and Silver-dot units using 100W-A-21 silvered bowl lamps produce higher lighting levels than all other types of recessed equipment using equivalent wattage. The Silver-spot unit develops nearly twice the candlepower of the 150W or projector lamp.

LOWER COST

Considering future lamp replacement and energy cost, the savings afforded by using Silver-spot and Silver-dot units will often pay for the equipment itself within 5000 hours of use of the unit.

EASIEST RELAMPING

Silver-spot and Silver-dot units use the compact 100W-A-21 silvered bowl lamp. They are designed so that lamps may be replaced either by hand or by using pole type vacuum operated lamp changers, without removing any fixture parts. No louvers, shields, glass or lenses to handle—no parts to get lost.

HIGHER MAINTAINED EFFICIENCY

The silvered bowl lamp with a sealed silver reflector is the heart of the Silver-spot and Silver-dot optical system. Each time a new lamp is installed the unit is restored to initial efficiency.

BETTER BRIGHTNESS CONTROL

In the Silver-spot and Silver-dot units the lamp filament is completely shielded by the silver process. The reflector is shielded by the fixture design to at least 45°. This means that these units can be used effectively in any area without glare or discomfort.

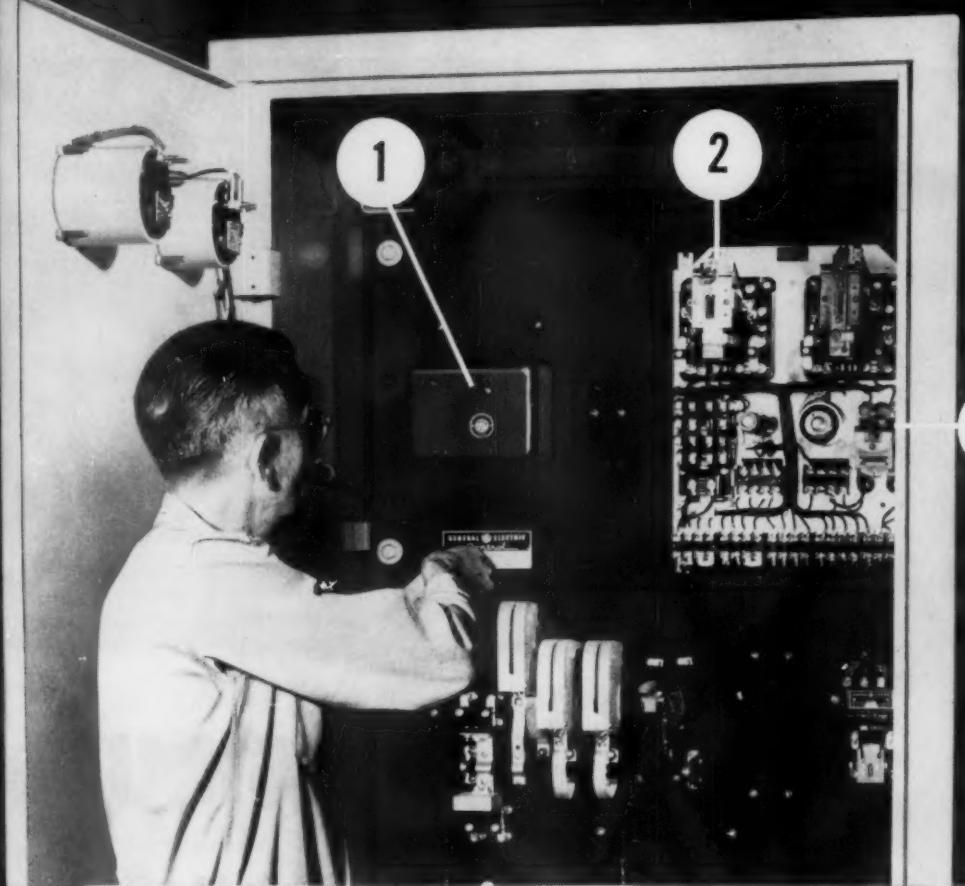
Silver-spot units may be recessed or surface mounted. Both Silver-spot and Silver-dot recessed units are furnished complete with plaster rings.

Each unit sold complete with two 100W-A-21 silvered bowl lamps.

SKYLIKE Lighting, Inc.		101 West Main St., Bound Brook, N. J.
Gentlemen:		
Please send complete details on Silver-spot and Silver-dot		
NAME		
FIRM	TITLE	
ADDRESS		
CITY	ZONE	STATE

SKYLIKE LIGHTING, INC.

RKO BLDG., RADIO CITY
NEW YORK 20, N. Y.



Only G.E. Gives You These 3 Features in Standard Synchronous Motor Control at No Extra Cost

1. GRADUATED SQUIRREL-CAGE PROTECTION

Relay protects motor during stall or subsynchronous operation. Protects squirrel-cage winding against overheating.

2. PRECISION ANGLE SWITCHING

Field application relay takes fullest advantage of motor's synchronizing ability—applies field at correct speed and most favorable angle between rotor and stator poles.

3. LOAD ANGLE FIELD REMOVAL

Fastest field removal available assures long motor life. Power-factor relay removes field within first half slip cycle out of synchronization.

You get these and other big features in *standard* G-E synchronous motor control at no extra cost. Be sure to get complete details—con-

tact your nearest G-E Apparatus Sales Office or use the convenient coupon to get our new 16-page descriptive bulletin.

Section B780-3
General Electric Company
Schenectady, N. Y.

Please send me your new bulletin, GEA-5873 which gives complete information on G-E Synchronous Motor Control.

Name _____
Position _____
Company _____
Address _____

GENERAL  **ELECTRIC**



Flood and spotlights in the new State of Alabama Agricultural Coliseum are mounted on catwalk 76 feet in the air. Transformers and feeder panels are on the ground. ELECTRUNITE E.M.T. was used for both installations.

HIGH UP... it's easier with

To make bends, accurately and quickly, all you need is the Republic one-piece calibrated bender.



Notice these close runs. Installing them was easier with ELECTRUNITE E.M.T. Tight joints were easily made without turning the whole raceway.

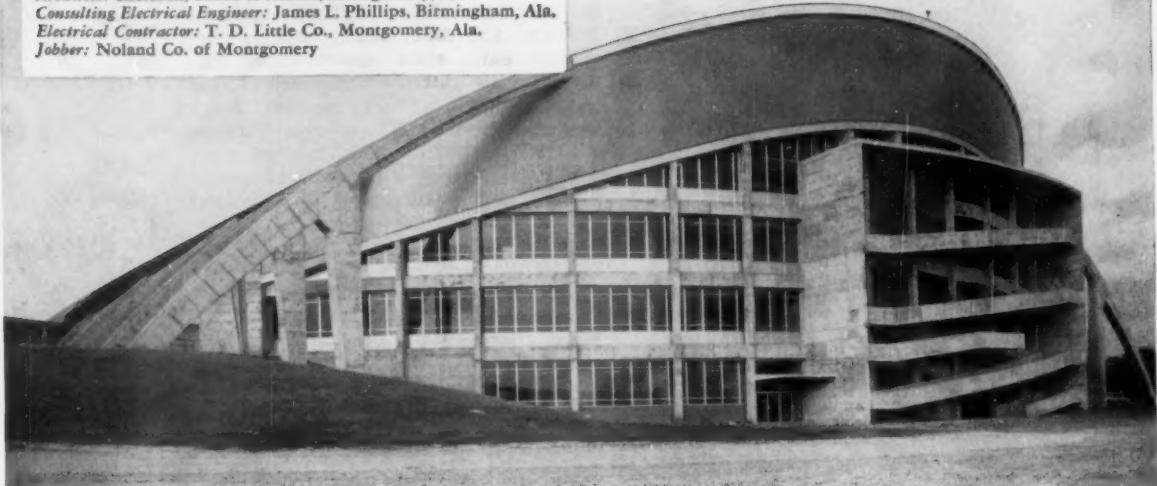


Exclusive "Inch-Marked" lengths are easier to cut... accurately. Using the ELECTRUNITE Bender, electricians make smooth, accurate bends.



Exclusive inside knurling of the popular sizes of ELECTRUNITE E.M.T. makes wire-pulling up to 30% easier.

State of Alabama Agricultural Coliseum, Montgomery, Ala.
Architect: Sherlock, Smith & Adams, Montgomery, Ala.
Consulting Electrical Engineer: James L. Phillips, Birmingham, Ala.
Electrical Contractor: T. D. Little Co., Montgomery, Ala.
Jobber: Noland Co. of Montgomery



OR ON THE GROUND

REPUBLIC

ELECTRICAL METALLIC TUBING

ONE BIG REASON is that Republic ELECTRUNITE E.M.T. goes in easily, especially in awkward places. Raintight and Concretetight joints are made without turning the whole run. Just tighten. Every fitting is a union.

Using the Republic calibrated bender and the exclusive "Inch-Markings" on the tube, bends can be made quickly and accurately. Wire-pulling is easier, too,

because of exclusive inside-knurling.

Take a tip from the many contractors who profit by all the advantages of this lightweight, threadless rigid steel raceway. Ask your distributor for Republic . . . the "Inch-Marked" E.M.T.

REPUBLIC STEEL CORPORATION

Steel and Tubes Division
212 E. 131st Street, Cleveland 8, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

REPUBLIC
ELECTRUNITE E.M.T.

• "INCH-MARKED"

The Mark of Quality



Save
threading time
with
Youngstown
Buckeye Conduit

Youngstown manufactures full weight rigid steel electrical conduit from start to finish. This enables Youngstown to control the complete manufacturing process from ore to final inspection, which insures that each length of Buckeye conduit is made of top-grade steel. High grade steel makes perfect threading easier, saves time and money. On your next job, be sure you get Youngstown Buckeye full weight standard threaded rigid steel conduit.

Shipments of Buckeye rigid steel conduit are now being made from our conduit mills at Indiana Harbor and Youngstown.

ON-THE-JOB JOURNEYMAN KNOWS BUCKEYE FROM EXPERIENCE: "My boss learned that extra time spent on threading and rethreading a batch of poor quality conduit is money wasted. That's why we use only Youngstown Buckeye rigid steel conduit now. When we work with Buckeye, threading goes fast and easy because high quality steel gives perfect threads every time."

ELECTRICAL INSPECTOR HAS HIS SAY: "As far as I'm concerned, poor threads open the way to troubles. One way to avoid poor conduit threads is to get the best steel available. In my opinion, that's Youngstown Buckeye standard threaded rigid steel conduit."

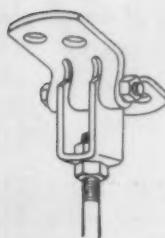
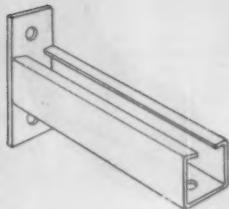
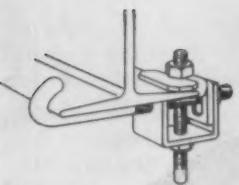
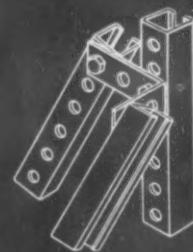
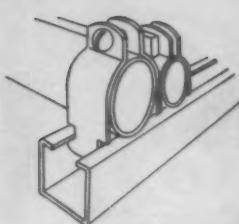


THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel
COLD FINISHED CARBON AND ALLOY BARS - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - WIRE - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - RAILROAD TRACK SPIKES.

General Offices - Youngstown 1, Ohio

Export Office - 500 Fifth Avenue, New York



KINDORF

CLAMPS, HANGERS, CONCRETE INSERTS

For Supporting Conduit, Lighting
Fixtures and Electrical Equipment

CHANNEL AND FITTINGS For Racks, Framing and Shelving

COMPLETE STOCKS AVAILABLE AT 2 PLANTS,
FOR IMMEDIATE DELIVERY

Oakland,
Calif.

Pittsburgh,
Penns.

Trained Sales Representatives
Located in Principal Cities

SOLD THROUGH ELECTRICAL WHOLESALERS
For Engineering Assistance, Contact Sales Representative or Write

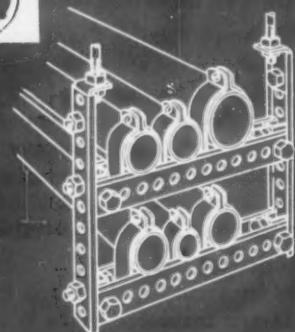
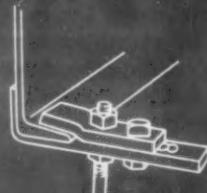
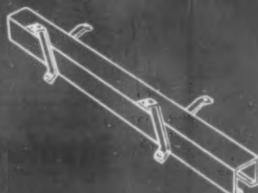
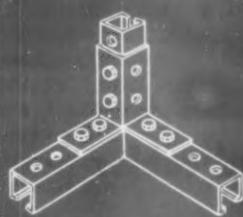


STEEL CITY ELECTRIC CO.

PITTSBURGH 33, PENNSYLVANIA

ELECTRICAL BOXES AND
CONDUIT FITTINGS

KINDORF DEVICES FOR
INSTALLING CONDUIT





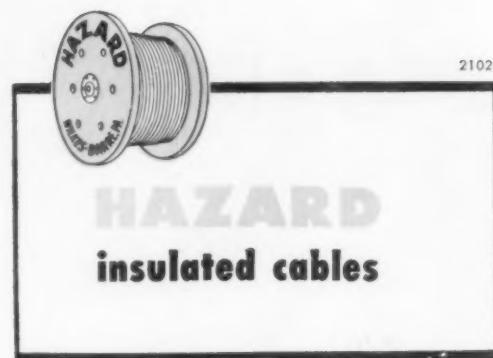
USE THE CABLE THAT FITS THE JOB!

Flexibility and toughness are musts for a good cable for portable tools . . . flexibility for easy handling, and toughness to resist constant twisting and abrasion. Hazcord Types SO and SJO meet these demands; they are the outstanding choice wherever long service life is an important factor.

Hazacord Flexible Cords and Portable Cables are built to withstand the abuse that they will get on the job.

Tire-tread toughness is built into Hazard cables by vulcanization in a continuous metal mold. The metal mold curing of the tough Hazaprene ZBF sheath combined with flexible conductors, strong laterals and a dependable insulation mean long service life and less frequent replacement in every portable cord or cable application.

Write for illustrated Bulletin EC-451 for more detailed information on Hazacord Portable Cables to Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.



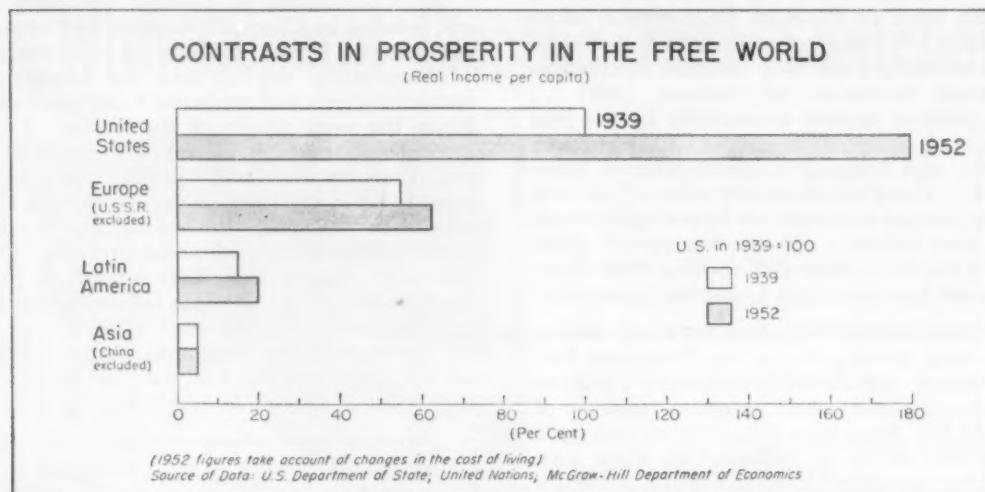
Contrasts in Prosperity Endanger the Free World

The chart in the middle of this page summarizes a situation of profound importance to every American. It shows that:

1. On the average, Americans are vastly better off economically than most other people in the free world, and
2. In recent years the gap in income between the average American and the average European, Latin American or Asian has greatly widened.

A Mounting Contrast

Even greater is the contrast between the real incomes of Asians and Americans. Today most Asians are no better off economically than they were back in 1939. On the other hand, the real income of the average American has almost doubled. As a result, the real income of the average Asian—always small by our standards—is now only a tiny fraction of that of Americans.



The chart shows that, at the outbreak of World War II, the real income (that is, actual purchasing power of income) of the average American was substantially higher than the average European's and much higher than the average Latin American's or Asian's. Since then, the European and Latin American have become better off. But the improvement in the economic lot of the average American has been so great that the others have been left far, far behind.

It must be remembered that the figures used to construct the chart are of varying quality. The fact is that few of the poorer countries have reliable statistics. However, it is generally agreed among competent observers, that the figures here presented offer a correct impression of the wide disparity in the average of real incomes between various parts of the free world. The figures, of course, have nothing decisive to say about spiritual and cultural values. In these coun-

tries with relatively little material prosperity may be rich.

It is possible to draw a variety of morals from the story of lagging growth of income in other parts of the world. For one thing, it reflects the dynamic force of private enterprise. Private enterprise is characteristic of our economy far more than it is of most of the other free economies. The chart also reflects the fact that we are bountifully blessed with the natural resources essential to a high level of real income. Moreover, we did not suffer from the devastation and waste of two world wars as did many of the other free nations.

Narrowing the Gap

But perhaps the most important message which the chart conveys is one of warning. It warns that something must be done to narrow the gap in prosperity between America and other parts of the free world, if that world is to be united successfully in the struggle against totalitarian Communism. Writing in the HARVARD BUSINESS REVIEW, Kenneth E. Boulding recently put it this way:

"The crux of the problem is how to raise the three-quarters of the world that live on a low level to the high level of the other quarter, for it is precisely this wide disparity that makes our world so unstable. American-Russian relations, for instance [are] . . . complicated almost unbearably by the fact that each power is competing for the support of the vast fringe of underdeveloped countries . . . These countries are dissatisfied with their present state and are hovering between the two cultures, wondering which offers them the best chance of shifting from their present low-level to a high-level economy."

Very real danger threatens from any feeling which may develop in the less fortunate free nations that our enviable economic progress has been made at their expense. Instead of viewing the American economic system as a model that might be followed by their own countries, they may be led to see in it a menace to their well-being. If Communist propaganda can persuade these people that their alliance with the free world will only result in their dropping farther and farther behind an increasingly prosperous United States, they will be driven to the side of totalitarianism.

Test of Effective Leadership

How can these free nations on the lower half of the income ladder be helped to alleviate the conditions that keep them there? Surely this question poses a whole series of complicated problems. Yet, if we do not exercise some

effective leadership toward their solution, we can be sure that Russia will take advantage of the situation. In these circumstances, it is essential to both the stability and security of the free world that we help our less prosperous neighbors make satisfactory headway.

This does not mean that the United States should sacrifice its own economic progress in favor of some sort of global leveling scheme. On the contrary, a continually expanding and stronger economy is essential if we are to provide any real aid to our friends. Also, it goes without saying that our friends must be disposed to do all they can to improve their own economic position, if our cooperation to that end is to be effective.

Great Skill Required

Our part in a program to achieve this goal calls for a high degree of skill and statecraft. It involves international trade policy, which, in itself, presents a perplexing range of problems. It involves also programs of foreign technical and economic assistance. And expanded foreign investment must play a key role in a balanced program to strengthen the economies of the free world for our common good.

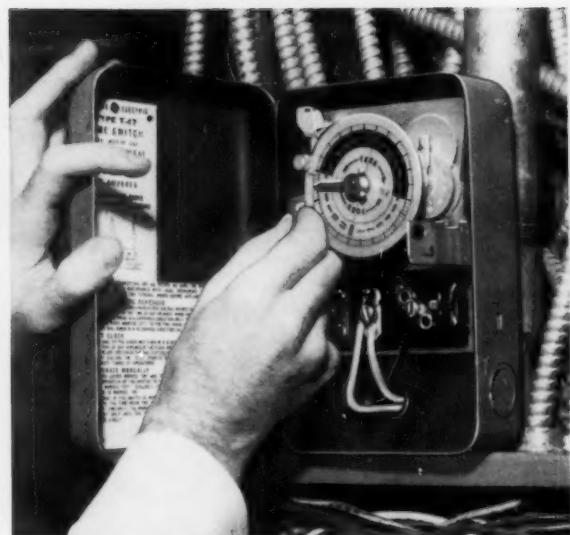
The Commission on Foreign Economic Policy, headed by Clarence Randall, has recently submitted a report, embodying the results of a monumental inquiry into our foreign economic relations and measures to improve them. From the very nature of the subject, discussion of the report is bound to be attended by much controversy and conflict. However, an awareness of the facts presented by this chart should inspire us to accord to the problems posed by the Randall Commission the careful and sober consideration they must have if any real progress is to be made in raising the general standards of human well-being throughout the free world. Our willingness and ability to do this have now become the real test of our statesmanship, both at home and abroad.

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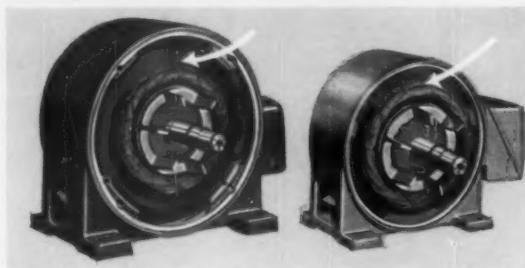
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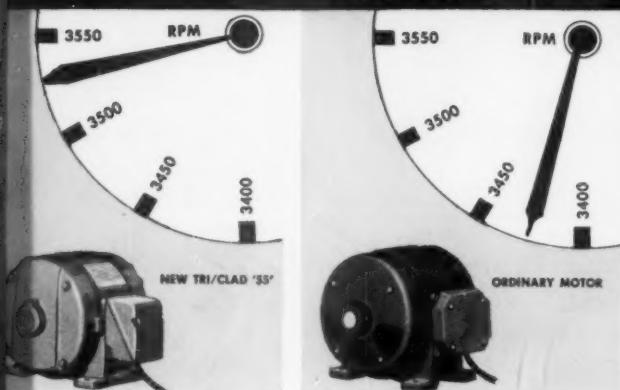
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Complete Line of Driproof, Enclosed Motors and Gear-Motors Available in Most Ratings in 1954

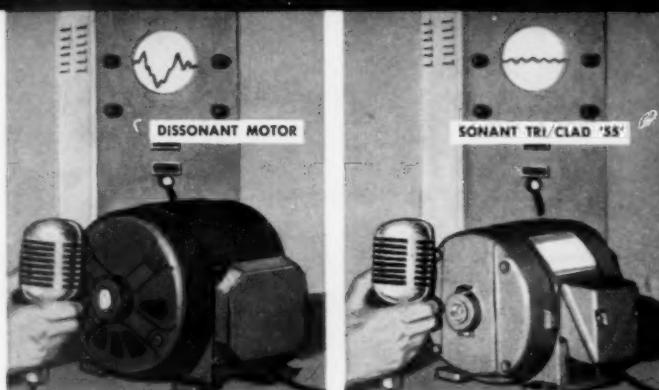
Here's the all-new Tri/Clad '55' motor — now available in NEMA 182 and 184 frame sizes.

You can get complete information on this dramatic motor achievement by writing for bulletin GEA-6013 on Tri/Clad '55' Driproof motors, GEA-6012 on Tri/Clad '55' Enclosed motors, or GEA-6027 on Tri/Clad '55' Gear-motors, or by contacting your nearby G-E Apparatus Sales Office or G-E Motor Agent. General Electric Company, Section 648-1, Schenectady 5, N. Y.

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GENERAL ELECTRIC

IF YOU SPECIFY OR BUY FLUORESCENT FIXTURES:

Here is why General Electric believes you should insist on series ballasts for 96T12 lamps

Several years ago, our engineers studied the merits of the series-type ballast circuit for operating the 96T12 lamp at 425 ma. It showed real possibilities for economy, both in ballast cost and size. With concentrated efforts, a series ballast design for this lamp was perfected. Then for the first time, a series-type ballast circuit meeting all lamp requirements and giving full rated lamp life was made available to you.

Actually, there was nothing basically new about the series-type ballast. As early as 1940, our engineers had studied such a circuit. As new lamps were made available over the years, the series ballast was investigated time and again. However, prior to the 96T12 lamp, the potential savings of the series ballast circuit had been discarded because no way had been found to meet lamp operating requirements.

During those years the lead-lag ballasting circuit was widely used for the various types of lamps then available. Naturally, this type of ballast gained wide acceptance in the lighting industry as the standard of ballast quality.

After the 96T12 lamp was introduced, a series ballast was developed which proved to be the best ballasting tool for this important new lamp. However, there was real hesitancy about accepting a series

ballast for the 96T12 because in the past, a lead-lag ballast had been found superior for other lamps.

We felt compelled to face this challenge and advocate the series ballast for the 96T12 lamp because, everything considered, we believe it is the best ballasting tool for that lamp—giving equivalent performance in accordance with lamp specifications and offering a very substantial saving in cost and size.

The results are now known throughout the lighting industry. Millions of series ballasts for operation of 96T12 lamps at 425 ma have been furnished to the industry in the last three years by ballast manufacturers. And because series ballasts for this lamp are inherently 20% less costly—even more millions of dollars in basic ballasting cost have been saved for fluorescent lighting users.

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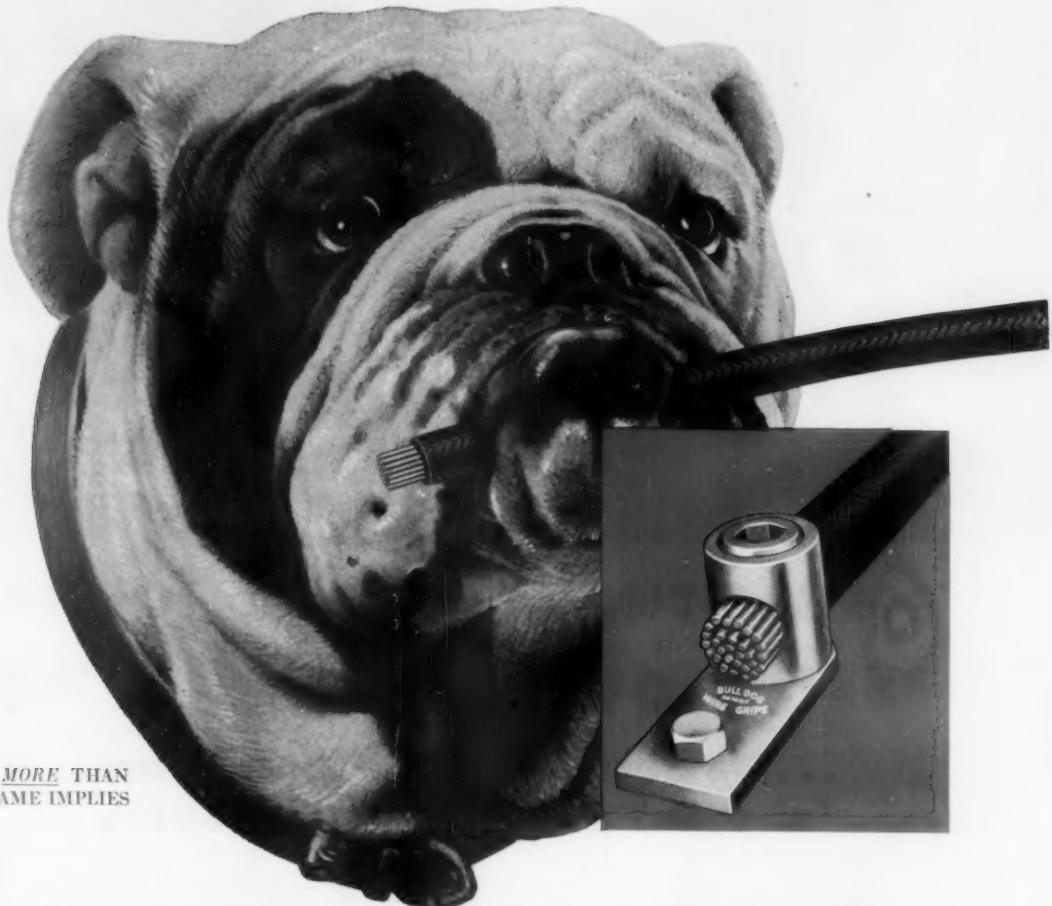
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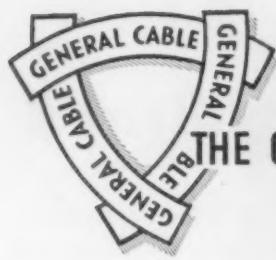
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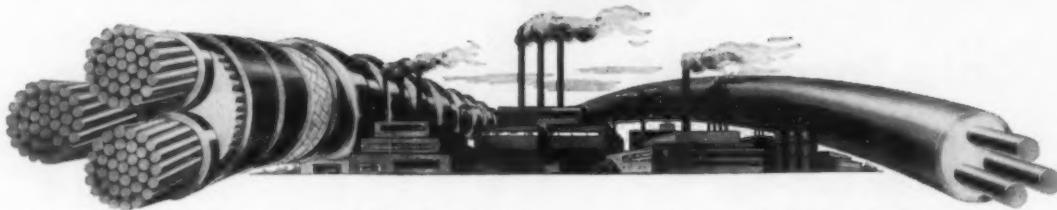
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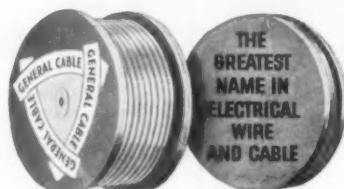
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PROOF OF LOW MAINTENANCE ON CLARK TYPE "CY" STARTERS

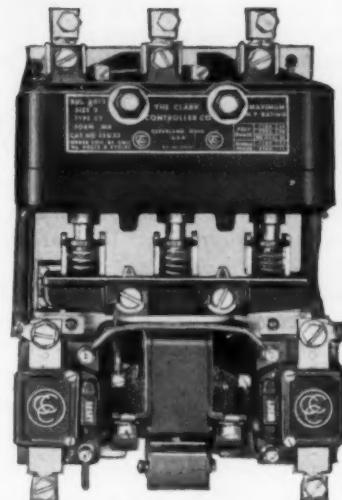
These unretouched photos show contact tips from a CLARK Bulletin 7707 contactor—the contactor used in the standard Bulletin 6013 size 2 AC Motor Starter—as they looked before and after a year of hard use.

The contactor is in service at Cleveland Hone and Manufacturing Company, on a special transformer and rectifier circuit used in processing automotive parts. The tips shown right above were removed from the contactor after 12 months of steady service, often operating as frequently as 5000 times per hour.

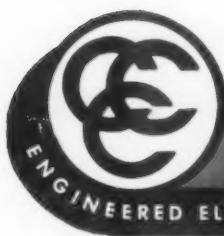
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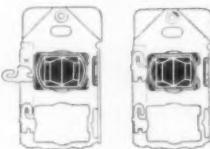


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With a small stock of P&S Despard devices you are prepared to assemble practically any desired combination. You can give more service, faster, with a smaller inventory—and a smaller investment. Small, compact P&S Despard devices take up little room on your shelves—weigh much less than old-fashioned devices.

• Makes Your Job Easier—Simpler

No need to stock (or wait for) special factory assembled combinations and clumsy, expensive multi-gang plates—no need for large bulky boxes. You can cope with the multitude of controls needed in modern institutional and commercial buildings—provide for real electrical convenience in modern homes—and assemble these good-looking combinations right on the job quickly and easily.

• Builds a Reputation for Quality

Thousands of P&S Despard installations throughout the country are proof of the dependability of these precision-built devices. T-rated switches and double grip outlets meet Federal Specifications. You can be sure of a trouble-free installation, with no come-backs.

• Gives You Merchandise You Can Sell

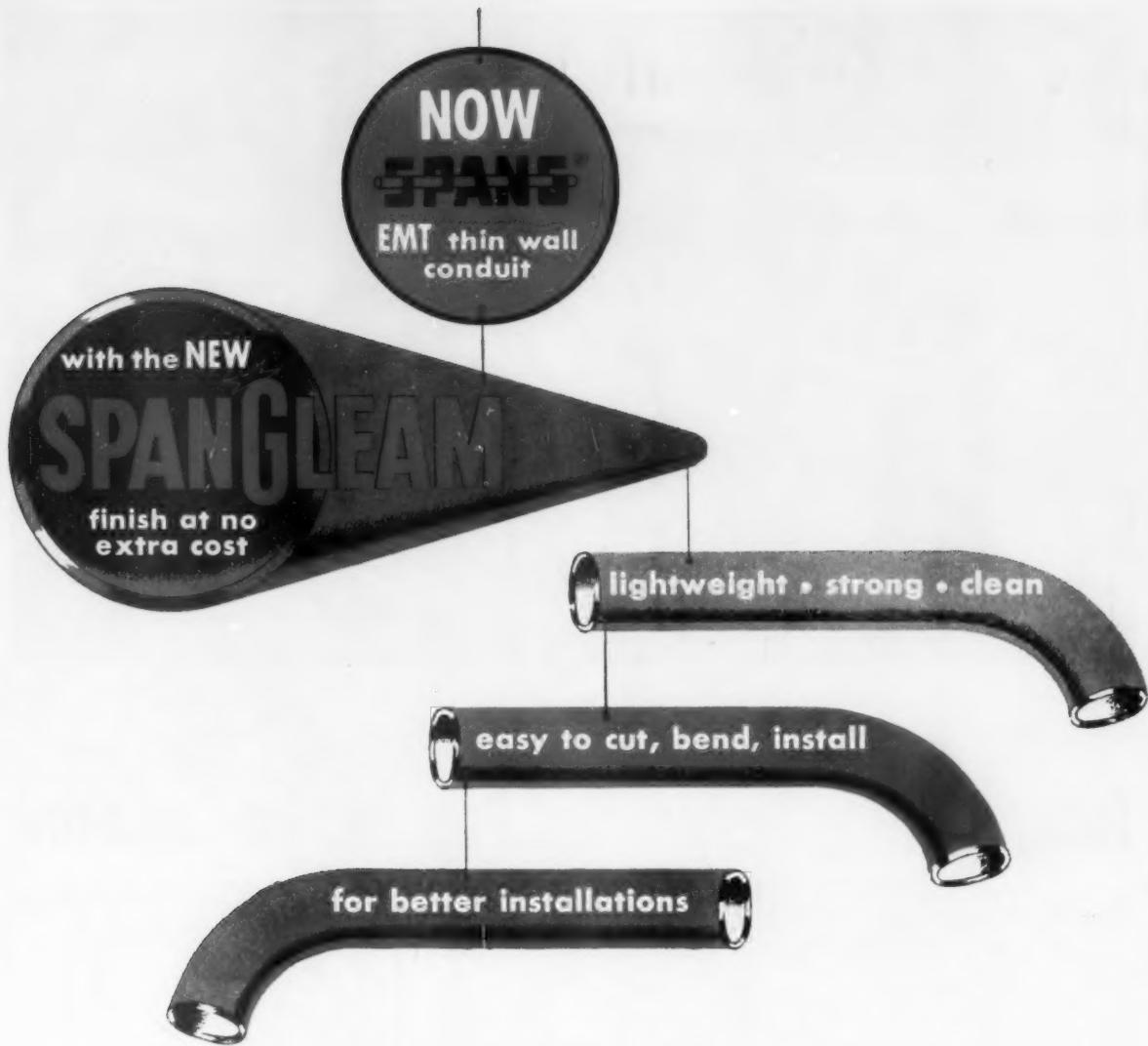
The P&S Despard Line looks different—and is different. The smartly styled, functional combinations have eye-appeal—yet, from a practical viewpoint, provide more convenience per dollar than any other line on the market. Build your business with P&S Despard beauty, convenience and dependability.

Use the coupon to get your copy of P&S Catalog 49.

PASS & SEYMORE, INC. SOLVAY STATION • SYRACUSE 9, N. Y.

OFFICES: 71 Murray St., New York 7, N. Y.
1229 W. Washington Blvd., Chicago 7, Ill.

Manufacturers of Switches, Outlets, Surfex, Turnlok, Polarized, Weatherproof Devices, Lampholders, Uniline Wall Plates.



Perfect Balance at work at your



Distributor's showroom

Next time you stop in at your Spang Distributor's showroom take a look at this new SPANGLEAM EMT mobile display. Here's an outstanding example of perfect balance at work. The display also tells you why SPANGLEAM EMT is the finest thin wall electrical metallic tubing you can buy. That's because there is . . .

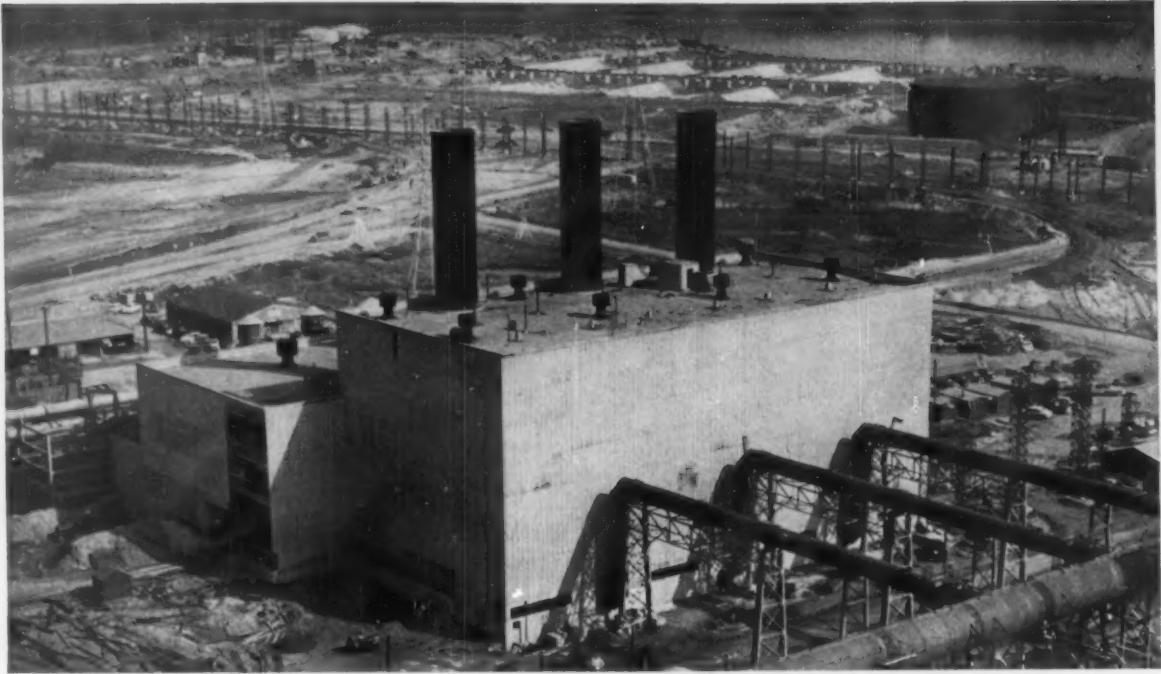
*Perfect Balance at work
in SPANGLEAM EMT*

SPANGLEAM EMT is made from top-quality steel, carefully controlled during manufacturing, scientifically finished inside and outside and thoroughly inspected to give

you a perfect product. This balance between top-grade material and top-grade workmanship means that SPANGLEAM EMT saves you time . . . gives you profitable installations.

Take a look at the SPANGLEAM EMT display . . . then try SPANGLEAM EMT on your next installation. You'll prove it to yourself that SPANGLEAM EMT is best!





U. S. STEEL'S FAIRLESS WORKS in Morrisville, Pennsylvania, part of which is shown above in final stages of construction, is designed for present efficiency and future expansion with . . .

Today's Wiring System that Prepares for Tomorrow

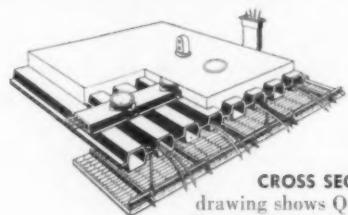
Gigantic Fairless Works — one of the largest steel mills ever built as a unit — includes the General Electric Q-Floor wiring system in vital office and service areas . . . a flexible wiring system that can easily be expanded and changed to meet future electrical needs. General Electric Q-Floor wiring in these areas means power can always be available when it's needed.

Q-Floor is the cellular steel subflooring that saves materials, weight, and construction time. The G-E Q-Floor wiring system makes each of the floor cells a potential wiring raceway, available for electric power, telephone, or interoffice communications circuits. Outlets can be installed wherever they are needed — now or in the future — without tearing up the floor or disrupting business.

Write for the free planning booklet on General Electric Q-Floor wiring — the system that provides for present and future electrical needs. Address Section C26-318, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in —

GENERAL  ELECTRIC



CROSS SECTION
drawing shows Q-Floor cells, wiring, header duct, outlet, and suspended soundproof ceiling.

Square D ML Panelboards give you . . .

LOWER INSTALLATION & MAINTENANCE COST REDUCED "DOWN TIME"



VAULT OR FLUSH LOCK
—important safety feature

TRIM CLAMPS
—indicating and
self-aligning

CIRCUIT BREAKER UNITS
Thermal-Magnetic, Quick-Make,
Quick-Break minimize "down time"

HANDLE-LOCKING ATTACHMENTS
available to prevent unauthorized
circuit switching

COMPACT
Box widths range
from 20" to 40"

SOLDER-SOLDERLESS LUGS
simplify connections to
mains and branches

ADEQUATE GUTTERS
—generous wiring space

ADJUSTABLE INTERIORS
facilitate neat flush installations

REMOVABLE ENDWALLS
simplify drilling
conduit openings

SQUARE D'S TYPE ML CIRCUIT BREAKER DISTRIBUTION PANELBOARDS

provide complete, 2-way protection through the use of thermal-magnetic breaker units. Costly "down time" is held to a minimum since circuit breakers can be reset quickly after the fault has been cleared.

Four circuit breaker frame sizes provide ratings ranging from 15 to 600 amperes, 250 or 600 volts.

CONVERTIBLE
Breaker units
interchangeable with
higher or lower ratings



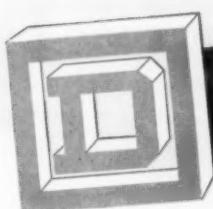
Type MLN

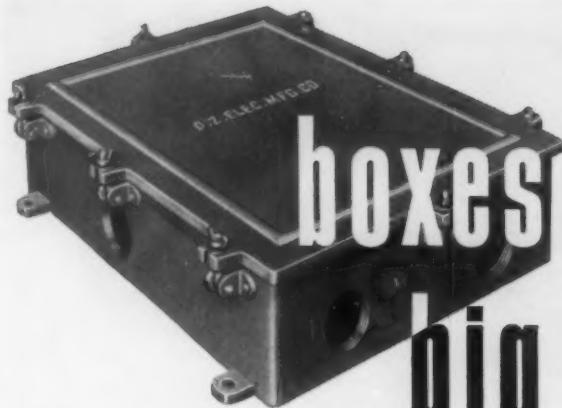


Type ML

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY





boxes are big business at

O.Z.

So big, in fact, that our junction box manufacturing facilities are located in a new 35,000 square foot plant. Here, in a modern building, are men, equipment and space to fabricate a complete line of surface and flush-mounting junction boxes for every application and requirement. A large stock is maintained at all times for speedy delivery. Your O. Z. distributor is now in a better position than ever to fill your needs.



Modern equipment for fabricating junction boxes in this O. Z. box plant means greater efficiency for us . . . better service for you.



Greatly increased stock assures a constant supply of standard junction boxes and speedy processing of your orders.



O.Z.

ELECTRICAL MANUFACTURING CO., INC.

262 BOND ST. • BROOKLYN 2, N.Y.

CAST IRON BOXES • SOLDERLESS CONNECTORS
CABLE TERMINATORS • GROUNDING DEVICES
POWER CONNECTORS • CONDUIT FITTINGS



IT'S EASY TO SELL **Stab-lok® TO BUILDERS** (gives them a big sales point, for pennies)

ALL OVER THE COUNTRY, builders are the biggest prospects for Stab-lok Circuit Breakers. They buy Stab-loks like hot cakes because they're convinced that modern circuit protection is a really important sales point with prospective home buyers. And, of course, Stab-loks cost only pennies more than fuse boxes...and across-the-board cost less than other circuit breakers when you buy them; less to install; less when you change or add circuits.

And look at these other *exclusive* Stab-lok features:

Absolute dependability—More Stab-loks are being installed today than all other circuit breakers put together...they're the only breakers service-proven in millions of homes.

Most complete line—Stab-lok with widest range of enclosures

meets every reasonable specification for circuit protection, easily, without fuss or bother.

Most flexible—Stab-lok Magic "E" and sequenced bussing, PLUS the standard, single pole NA, the new thin NC and the double pole (simultaneous trip) breakers, provide flexibility unapproached by any other system.

Most distributors—Stab-lok distribution is completely tops; breakers and enclosures are delivered promptly—everywhere.

Sure, keep after the smaller prospects for Stab-lok—they all add up. But go after builders, too, and sales will *multiply*. And write for the Magic "E" booklet giving latest Stab-lok facts. Federal Electric Products Company, 50 Paris Street, Newark 5, N. J.



FEDERAL & PACIFIC

ELECTRIC PRODUCTS COMPANY

ELECTRIC MANUFACTURING CORP.



Federal products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct—**Pacific Electric products:** High voltage circuit breakers and power switches ★ Sales offices in principal cities.

CFI DAY-LINE®

(COMFORT FOR INDUSTRY)

Easy to handle



Easy to install

Contractor features include knockouts and fittings for pipe, chain, stem and messenger cable suspension; no-sag, no-bend one-piece reflector; simplified wiring.

AND LOOK AT THESE USER FEATURES THAT DELIVER EXTRA VALUE AND SATISFACTION TO YOUR BUYERS!



COMFORT FOR INDUSTRY. Die-embossed apertures in reflectors provide 10% up-lighting for improved visual comfort and freedom from irritation and nervous fatigue due to eye-strain.



ALL-WHITE PORCELAIN REFLECTORS. Outside as well as inside, entire one-piece reflector is finished in snow white porcelain enamel—providing maximum high reflectivity surface.

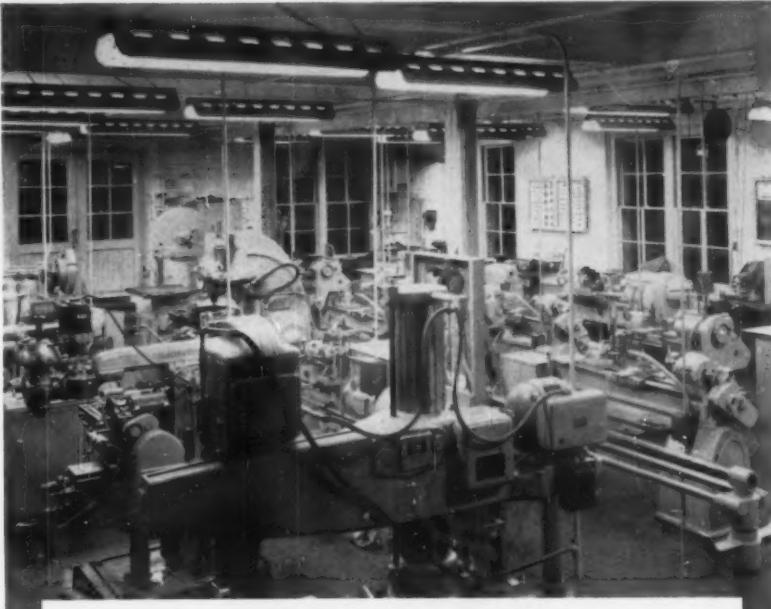


COOLER, CLEANER OPERATION. A gentle flow of air passes through the apertures reducing dirt and dust deposits. This "breathing" action keeps fixture cooler, cleaner and more efficient.



TURRET® SOCKETS. Sturdy, vibration-proof Turret sockets are standard equipment on all CFI DAY-LINES—providing positive lamp seating and simple lamp installation or removal.

® G. E. Co.



THE CFI DAY-LINE ON THE JOB. Note how uplighting cuts down uncomfortable brightness contrast. CFI DAY-LINE is available in 2 and 3 lamp (75W) open-end 8 ft. Slimline units; 2 and 3 lamp (40W) open- and closed-end 4 ft. RAPID-START Fluorescent units; 2 lamp (90W) open- and closed-end 5 ft. Fluorescent units with NO-BLINK starters.

Day-Brite Lighting, Inc., 5402 Bulwer Avenue,
St. Louis 7, Missouri. In Canada: Amalgamated
Electric Corp., Ltd., Toronto 6, Ontario.

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

421

NATIONALLY DISTRIBUTED EXCLUSIVELY THROUGH LEADING ELECTRICAL WHOLESALERS

An explanation by a world famous motor manufacturer of a price policy which offers savings up to 40% to American buyers



Motor-making has been our exclusive business for 18 years. Since 1935 we've sold approximately two million British-built motors in 62 countries. Right now we're making and selling an even greater volume.

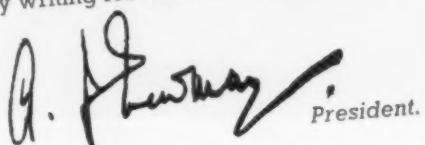
When a firm like ours decides to bring its full line of motors into the American market, it's a big move. First, we had to be certain that we could offer something extra, for modern competitive marketing does not respond to reputation, quality and character alone. Clearly, we had to be dramatic. And fortunately we can afford to be. We are offering the full line of world-famous NEWMAN

motors at savings up to 40%.

We can do this for two reasons: Economics favor us by keeping down our cost of manufacture; the largest motor production in our history has given us a further cost margin.

We are offering with the lowest prices an unconditional guarantee on all types and sizes of Newman motors, and any motor will be sent free for examination and testing.

Obviously we are trying to meet American industry on its own terms. Our motors, of squirrel cage totally enclosed fan cooled design and drip-proof wound rotor types to 230 horse-power, are available for immediate delivery from stock. And a nation-wide sales and service organization has been established. All motors are of unsurpassed quality and conform to N.E.M.A. standards. But you can compare these values yourself by writing for more information today.



President.

Newman

NEWMAN INDUSTRIES (AMERICA) INC.
43 BROAD STREET
NEW YORK 4, NEW YORK

NEWMAN INDUSTRIES (AMERICA) INC.
43 Broad Street, New York 4, New York

Please send me a catalog and price list of the full line of NEWMAN MOTORS now available in the United States at savings up to 40%.

Attention of _____
Company Name _____
Address _____
City _____ State _____



Here's a good reason why
It's wise to buy
on over-all cost...

not price



Engineered for dependable, economical circuit protection

I-T-E Circuit Breakers assure protection—they're pretested twice!

I-T-E Circuit Breakers take the guesswork out of circuit protection—even before you buy them! They're actually *pretested* on simulated overloads.

Every I-T-E breaker is precisely calibrated and twice-tested at 200% of its continuous current rating. These vital checks assure *you* of getting the proper operating characteristics required by Underwriters' Laboratories, Inc.

If you're looking for dependable, long-term electrical protection—specify modern, trouble-free I-T-E Circuit Breakers. They give you the *warranted* performance that only pretesting can provide.

Remember—in electrical protection, *overall* cost is the cost that counts. Check with your local I-T-E distributor, and see how much more economical pretested I-T-E Circuit Breakers really are—compared with fusible-type protective devices.

I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Philadelphia 30, Pa.

**"TEN REASONS WHY"
I-T-E CIRCUIT BREAKERS
PROVIDE THE UTMOST
IN MODERN CIRCUIT
PROTECTION**

1. They offer the highest degree of safety to personnel.
2. They reduce production down-time.
3. They eliminate replacement costs and maintenance.
4. They are completely tamperproof.
5. They are pretested to insure uniformity of operation.
6. They prevent single phasing when a fault occurs.
7. They safely carry their continuous current rating indefinitely.
8. They save mounting space.
9. They offer a wide range of special attachments and enclosures.
10. They incur low watts loss.


I-T-E CIRCUIT BREAKER CO.
Philadelphia, Penna.

The other side of this handy pocket card tells you how to select I-T-E Molded Case Circuit Breakers for various feeder and branch circuits. Write for card and other application data, or see your local I-T-E Distributor.

I-T-E Individually Enclosed Circuit Breakers

B-M fittings

THE ORIGINAL
INDENTER TYPE
E.M.T. COUPLINGS
AND CONNECTORS



Briegel, the Original Indenter Fittings are neater in appearance, easier and faster to use. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job.

All B-M Indenter Fittings are U. L. approved as Concrete-tight and for General Use. (File Card E 10863)



BRIEGEL
METHOD
TOOL
CO.
GALVA, • ILLINOIS

Warehouse Stocks in Principal Cities for Immediate Delivery!

The wiring in the average structure to-day
is entirely inadequate for the load required
by many new electrical appliances.

What Can Be Done About It?

Rewire with CRESCENT!



TYPE TW BUILDING WIRE

GET GREATER CURRENT-CARRYING CAPACITY IN THE SAME CONDUIT

Many building owners do not realize the need for more adequate wiring of their property. The electrical contractor can offer a real service by recommending the rewiring of existing circuits with CRESCENT SYNTHOL TYPE TW BUILDING WIRE. It is less expensive than installing completely new conduit, and yet as shown by examples to the right, considerably increases the current-carrying capacity.

It means business for YOU!

1/2" CONDUIT



ORIGINAL
INSTALLATION
(Wires already in)



REWIRED
(As permitted by N.E.C.)

3 conductors of
12 wire with
maximum current
rating of

Will permit installation of
3 conductors of #8 CRESCENT SYNTHOL TYPE TW WIRE, thereby doubling the maximum current carrying capacity in the same existing conduit to

20 AMPS. 40 AMPS.

3/4" CONDUIT



ORIGINAL
INSTALLATION
(Wires already in)



REWIRED
(As permitted by N.E.C.)

3 conductors of
10 wire with
maximum current
rating of

Will permit installation of
3 conductors of #6 CRESCENT SYNTHOL TYPE TW WIRE, thereby increasing the maximum current carrying capacity in the same existing conduit to

30 AMPS. 55 AMPS.



CRESCENT

WIRE & CABLE

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, NEW JERSEY



dependable McGILL® lamp guards outlast all others

Here are two of the many McGill portable lamp guards that will withstand the hard wear and abuse of heavy industrial use. McGill 7000 and 650 series lamp guards last many times longer than ordinary guards because of exclusive design, heavier and better quality material and superior workmanship.

These models have pliable molded rubber handles and extra heavy steel wire cages that are electrically welded for strength and zinc plated with chrome finish to remain clean and bright for years. Sockets are 660 watt 250 volt, either plain or waterproof.

Such extras as cord seals, larger hooks and No-Rol ears to prevent cage rolling add to the safety and convenience of using dependable McGill portable lamp guards.

*heavy steel wire
electrically welded*



*proven dependable
Levolier® switch*

rubber hook handle



Model 7000-SR with Rubber Handle, Reflector and Levolier Switch.

Model 650-SR with Curved Rubber Handle. This exclusive handle design permits hanging portable cage down so that light is free from any possible handle obstruction.

all are McGILL® quality



Model 5000-SR
Convenience Outlet,
Reflector and Switch.



Model 5025-SLRG
Grounded
Concentrating Lens.



Model 3006
Vaporproof Guard.



Model 5500-SRG
Grounded, No Outlet,
Closed End Cage.



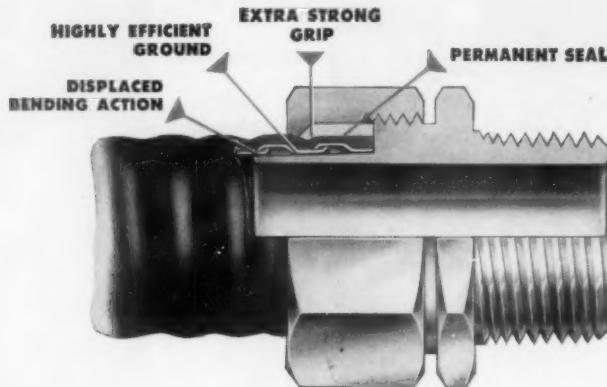
Send for the new McGill Catalog No. 49-A
describing the complete line of McGill
Lamp Guards, Sockets and Switches.

McGILL MANUFACTURING COMPANY, INC.
450 N. Campbell St., Valparaiso, Indiana

McGILL
electrical specialties

it's new—an improved connector for liquid-tight flexible conduit

(Sealtite or equivalent products)



PYLE - NATIONAL

"CT" series Connectors offer all these advantages

EXTRA STRONG GRIP

- Compression force is supported—not by the conduit alone—but also by the body shank, making a vise-like clamp.
- Gripping is well behind end of flexible conduit for firm anchorage against creeping loose.
- Pliable seamless sleeve makes a plastic-to-plastic grip with the conduit sheath...thereby avoids cutting and abrasion common to metal sleeves.
- High safety factor of compression range more than compensates for tolerance in the outside diameter of the flexible conduit.

HIGHLY EFFICIENT GROUND

- Less than 10 millivolt drop.
- Tapered grounding shank, integral with connector body, makes a firmly wedged contact with the flexible metal conduit.

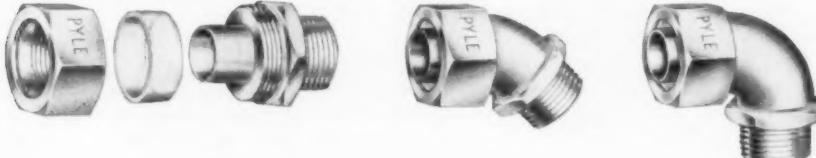
PERMANENT SEAL

- Plastic sleeve and conduit sheath have equivalent physical characteristics therefore the seal will last the life of the conduit, unimpaired by temperature variations within the limits of the conduit.

DISPLACED BENDING ACTION

- Tapered grounding shank is elongated to extend beyond gland nut, thus avoiding short radius bends which shorten the life of the conduit sheath and more important the permanency of the joint.

"CT" Series connectors can be installed assembled...no parts to lose...no wasted time. Available in straight, 45 degree and 90 degree types for $\frac{3}{8}$ " to 2" liquid-tight flexible conduit. Meet U/L and J.I.C. standards.

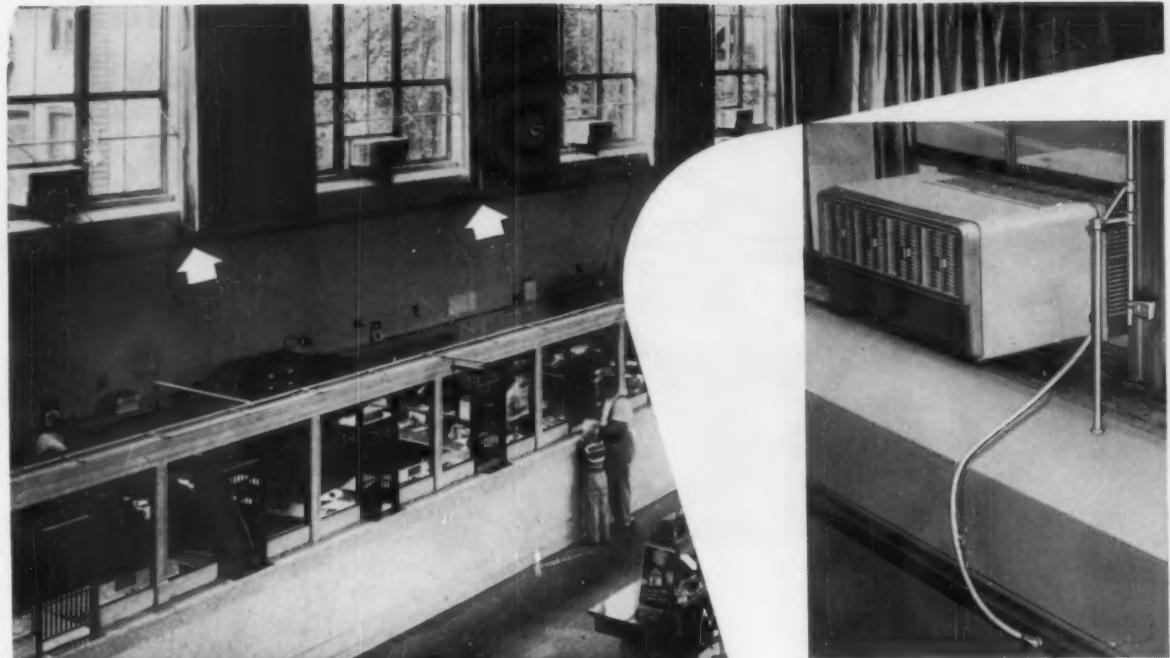


THE PYLE - NATIONAL COMPANY

1344 North Kostner Avenue, Chicago 51, Illinois

Branch offices and Agents in the Principal Cities of the United States • Canadian Agent: The Holden Company, Ltd., Montreal
Export Department: International Railway Supply Company, 30 Church St., New York

PLUGS AND RECEPTACLES • GYRALITES • TURBO-GENERATORS • FLOODLIGHTS • CONDUIT FITTINGS • MULTI-VENT



National Electric Surfaceduct

saves 40 man-hours in air conditioning installation

Electrical contractor E. F. Miles of Pittsburgh proved that quick, safe, economical wiring for air conditioning is easy with National Electric Surfaceduct.

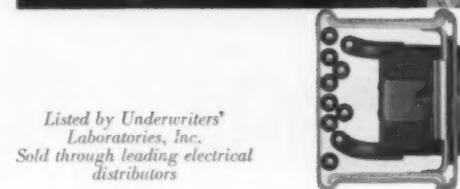
He estimates that he saved 40 man-hours in job time by using this all steel surface raceway because:

1. The concrete floor only had to be tapped once to bring wiring to Surfaceduct. (Without Surfaceduct it would have been necessary to drill through the floor nine times to run lines to each of the nine units.)
2. No wire fishing was necessary. (With Surfaceduct you merely attach the base, lay-in the wires, snap on the capping.)

Furthermore, the entire new wiring system was installed without interfering with the bank's normal operations.

Surfaceduct is ideal for every commercial or industrial electrical need up to 60 amperes. It's a sturdy, unobstructed wiring channel (1 $\frac{5}{8}$ " x 2 $\frac{1}{8}$ ") that installs fast. All parts fit together accurately, easily, with a minimum number of fittings. And it is by far the most economical method of modernizing old, inadequate wiring or providing additional electrical service wherever it's needed.

Neat, attractive Surfaceduct supplies electric power outlets for window air conditioners at West End Bank, Pittsburgh. Circling the room beneath plaster cove, Surfaceduct has plenty of capacity for future electrical requirements, yet is scarcely noticeable, does not alter architectural lines.



*Listed by Underwriters' Laboratories, Inc.
Sold through leading electrical distributors*



EVERYTHING IN WIRING POINTS TO →
National Electric Products

PITTSBURGH, PA.

3 Plants • 7 Warehouses • 34 Sales Offices

Washington Report

Lower taxes and reduced inventories are expected to bolster the economic outlook. Personal income tax reductions last January 1 provide individuals with about \$3-billion more to spend this year, and expiration of excess profits tax at the same time will give corporations an additional \$2-billion. The excise tax cut scheduled for April 1, now under debate in Congress, would lop off an estimated \$800-million on merchandise involved (autos and accessories, gasoline, beer, cigarettes, sporting goods, etc.), and provide both material and psychological relief for current business conditions.

Total production of goods and services (GNP) were at annual rate of \$362.5-billion in mid-February, down \$8.5-billion from last year's peak. Output reductions were to reduce inventories, Commerce Department explained.

Imports of heavy electrical equipment, increasing steadily during the past three years, have been studied in detail by Electrical Equipment Division of BDSA, Dept. of Commerce, with special emphasis on defense and security aspects. The Division has recommended BDSA take steps to have purchases of foreign electrical equipment with ratings of 13,000 volts or over prohibited from import into this country through revision of Tariff Act.

Post-attack planning for continuity of plant production is under active study by BDSA, now trying to determine how best to approach management. Plans will involve protective construction, possible methods for safer electrical installations.

More copper will become available for civilian use on April 1 when an amendment to M-11A (basic copper control order) goes into effect, BDSA has announced. The amendment will reduce "set asides" to fill military and atomic energy orders which have been required of brass and wire mills, foundries and other makers of copper products since 1950, when NPA put the order in effect.

Civilian users of nickel will get about the same amount of this still scarce metal this year as last, ODM's Boss Fleming recently told a Senate Interior investigating subcommittee. Allotments during first quarter will be curtailed, he said, because of increased purchases for Government's strategic materials stockpile.

Lead and zinc producers have asked for Government aid as imports have zoomed and prices have plummeted over the past several months, causing mines to close throughout the West. A cabinet committee is trying to determine what Government policy should be before recommendation is made to President Eisenhower.

New construction expenditures in January topped 1953 figure for same month by 3%, with a total of \$2.4-billion. Privately-financed work was up 5% over year ago, while publicly-financed work dropped 3%, according to report by Depts. of Commerce and Labor.

Federal housing programs are up for major revisions in Congress. Bills introduced in House and Senate Banking Committees are aimed at reductions of Government participation in housing activities, and encouragement of private industry in providing adequate housing for all income groups.

Housing starts in January were reported at 66,000 by BLS, down 3% from December and 8% from a year earlier. Declines were in the eastern seaboard states, and mountain and northwest central regions, where extreme cold weather existed. House building activity elsewhere continued strong for the time of year.

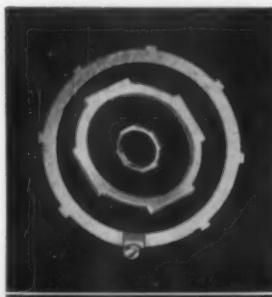
Highway construction would be accelerated by a bill introduced in Congress recently which would increase Federal aid to \$850-million annually from the present \$575-million. Matched by states on a 50-50 basis, new construction on Federal-aid roads would total about \$1.7-billion a year.

ANY FITTING YOU CAN THINK OF!

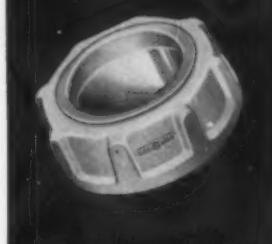
**Gedney's got it...in malleable iron...accurately machined
...quickest, least costly to install**

IT'S RIGHT THERE in the Gedney line...every fitting that you need for every sort of installation! And Gedney fittings are accurately machined and threaded...made of unbreakable malleable iron...

individually inspected to assure you the lowest installed costs obtainable today! Always order Gedney fittings and you'll *always* make maximum savings of time and money.



CONDUIT LOCKNUTS — sizes from $\frac{1}{8}$ " to 6". Sizes $\frac{3}{8}$ " to $1\frac{1}{2}$ " are made of heavy nut lock steel... all other sizes, malleable iron. All sizes cadmium plated. Also bonding wedge locknuts, $\frac{1}{2}$ " to 6".



CAPPED BUSHINGS — available in a standard range from $\frac{1}{2}$ " to 6". Made of unbreakable malleable iron, cadmium plated.



3-PIECE CONDUIT COUPLINGS — come in a large range of sizes from $\frac{1}{2}$ " to 6". Malleable iron, cadmium plated.



PIPE STRAPS — 1 hole — for rigid E.M.T. and service entrance cable. Available in a full range of standard sizes. Malleable iron, hot dip galvanized.



CORNER PULL-IN ELBOWS — made in $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1", $1\frac{1}{4}$ ", $1\frac{1}{2}$ ", and 2" sizes. Outstanding for space saving, machine wiring, easy wire pulling. Malleable iron, cadmium plated.



NAIL STRAPS — for rigid E.M.T. and S.E. cables with O.D. of .706 to 1.163 inches. In sizes $\frac{1}{2}$ ", $\frac{3}{4}$ ", and 1". Malleable iron, cadmium plated.



GEDNEY FITTINGS FIT

GEDNEY
ELECTRIC COMPANY



RKO BLDG. • RADIO CITY • NEW YORK 20
Foundry, Factory and Shipping Point: Terryville, Conn.

MARCH . . . at a Glance

DIAMOND JUBILEE—Celebration of Light's 75 years of growth and progress this year is an all-industry affair. Jubilee plans are being sponsored by the Edison Electric Institute and everyone in the electrical industry is being urged to participate. Electrical contractors can and should take a prominent part in these activities. Suggested ideas for contractor participation are outlined in detail in an exclusive eight-page feature beginning on page 78. Reprints are available at 15 cents per copy.

FUNCTIONAL SYSTEMS—The functional design approach to residential electrical systems offers a simple and sure answer to wiring adequacy. It meets the problem head on by deliberately anticipating load requirements. "Design Aids for Residential Electrical Systems", page 69, presents useful and handy data for quickly setting up service and circuit requirements on the basis of the load ratings of the various appliances and equipments the system is intended to serve.

BOOKS—New books of interest to our readers will be announced hereafter, with a brief review, following the Catalogs and Bulletins listing. You may request further information about them by means of the Reader Service card. Your request will be forwarded

to the book publisher. This new reader service begins in this issue, (page 167).

FOOTNOTE TO "THE WRONG ROAD"—NECA President Don Clayton, Sr. sounds a reassuring note in his statement in February "Qualified Contractor", official organ of the National Electrical Contractors Association, referring to our editorial "The Wrong Road". Readers will recall that we challenged the direction of the 1954 NECA Business Development Program as presented at the Miami Beach convention because it was devoted to the specific competitive advantage of members adversely to the interest of non-members.

In what may be an important policy statement President Clayton restates the objectives in terms that could apply to a broad industry-benefit activity and points out that contractors who are "not members of NECA . . . can find nothing that they can complain about in the program."

AIR CONDITIONING—Among the more rampant industries of our immediate times is air conditioning. Every year enthusiasts predict unbelievable growth and find themselves far short of actual market achievements. In such turbulence we might expect some confusion in distribution, marketing, installation and maintenance.

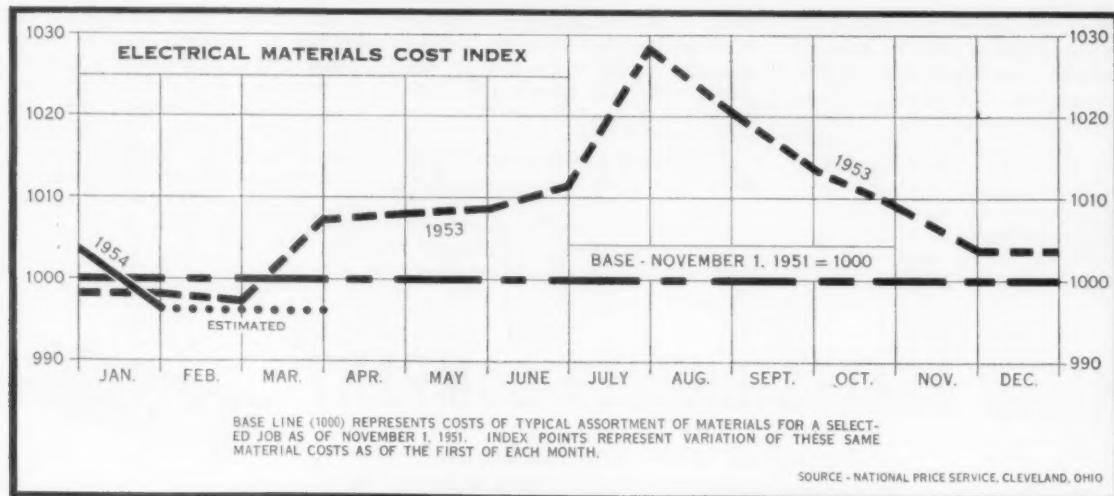
Electrical contractors and dealers have had a lot to do with the sale and installation of air conditioning equipment. But no reliable appraisal of the industry's role in air conditioning as a whole has come our way.

So last month we asked a statistically random list of electrical contractors to reply to a painfully long but, we hope, a relatively easy and systematic questionnaire about their air conditioning experience and plans. A gratifying number replied and expressed interest in the results.

The returns are now being tabulated and will provide the basis for an analysis in our next issue of the role of the electrical contractor in the installation, servicing and marketing of air conditioning.

Also, in timely anticipation of the summer season, our April issue will carry a special report on appraising air conditioning loads and how to select, apply, install and service self-contained "package" air conditioning equipment.

LIGHTING CONTEST—In case you missed the announcement last month, Light's Diamond Jubilee Lighting Competition for Electrical Contractors sponsored by Electrical Construction and Maintenance will give \$1350 in awards for the best lighting installation initiated and sold by electrical contractors.





Are You Putting Up This Sign Too Often?

Putting this sign up just once is too often.

Most of the time it means a costly shut-down, idle workmen, delayed production, very often caused by the failure of such a low-cost, but extremely vital item as portable cords. U. S. Rubber scientists have engineered U. S. Royal Portable Cords and Cables to give the longest possible life and durability. The flexible conductors are insulated with a high-grade rubber compound, and the conductor assembly is protected by

60% Neoprene jacket vulcanized in lead — thereby assuring maximum density and ruggedness. Rubber fillers are used in all portable cables, and also in the larger sizes of the portable cords. In all cases, the Neoprene jacket is reinforced internally with a strong fibrous braid.

U. S. Royal Portable Cords and Cables have extra efficiency and strength that make them ideal for use on portable electric machinery, tools, lamps, electric sanders and polishers, railroad equipment, and

wherever a tough flexible cord is required.

Remember that United States Rubber Company is the only manufacturer of electrical wire and cable to grow its own natural rubber and make its own synthetic rubber and plastics. That's why "U. S." gives you a quality controlled product. Write to address below for your free copy of our general catalog on electrical wires and cables.

UNITED STATES RUBBER COMPANY

Electrical Wire and Cable Department
Rockefeller Center • New York 20, New York

U.S.RUBBER
SERVING THROUGH SCIENCE

Electric Systems Unlimited

Will a 10 year guarantee of performance break through the house wiring barrier? It has public interest, consumer benefit, quality standards, saleability, simplicity, real value. More than that, it would be an unparalleled act of industry responsibility.

For eight years we have watched the greatest era of home building of all time. It has been matched by a stupendous demand for electrical appliances, lighting and gadgets. As utilization soars into the stratosphere, the "minimum" wiring job mocks us from bright new housing developments all over the country.

We have splendid "Adequate Wiring" promotion. It is backed by powerful and growing industry support. There is no want of will or energy or ability. We have unquestioned capacity to install the finest wiring systems at moderate cost. And beyond any competent question, the home owner needs the wiring we propose.

What does the home owner want and expect of the electrical system when he buys a house? He expects to be able to plug in any lamp, appliance or gadget he has money to pay for and to have it operate satisfactorily. This is not only what he expects of wiring but it probably defines the limit of his interest in wiring.

We insist, however, that he shall not only understand wiring on our terms but that he shall understand it well enough to make critically important decisions on a highly technical level. He must recognize the limitations of "code" installations. He must recognize the superiority of "adequate" wiring. He must know about circuits and service capacity. He must appraise his future requirements and insist that they be provided for.

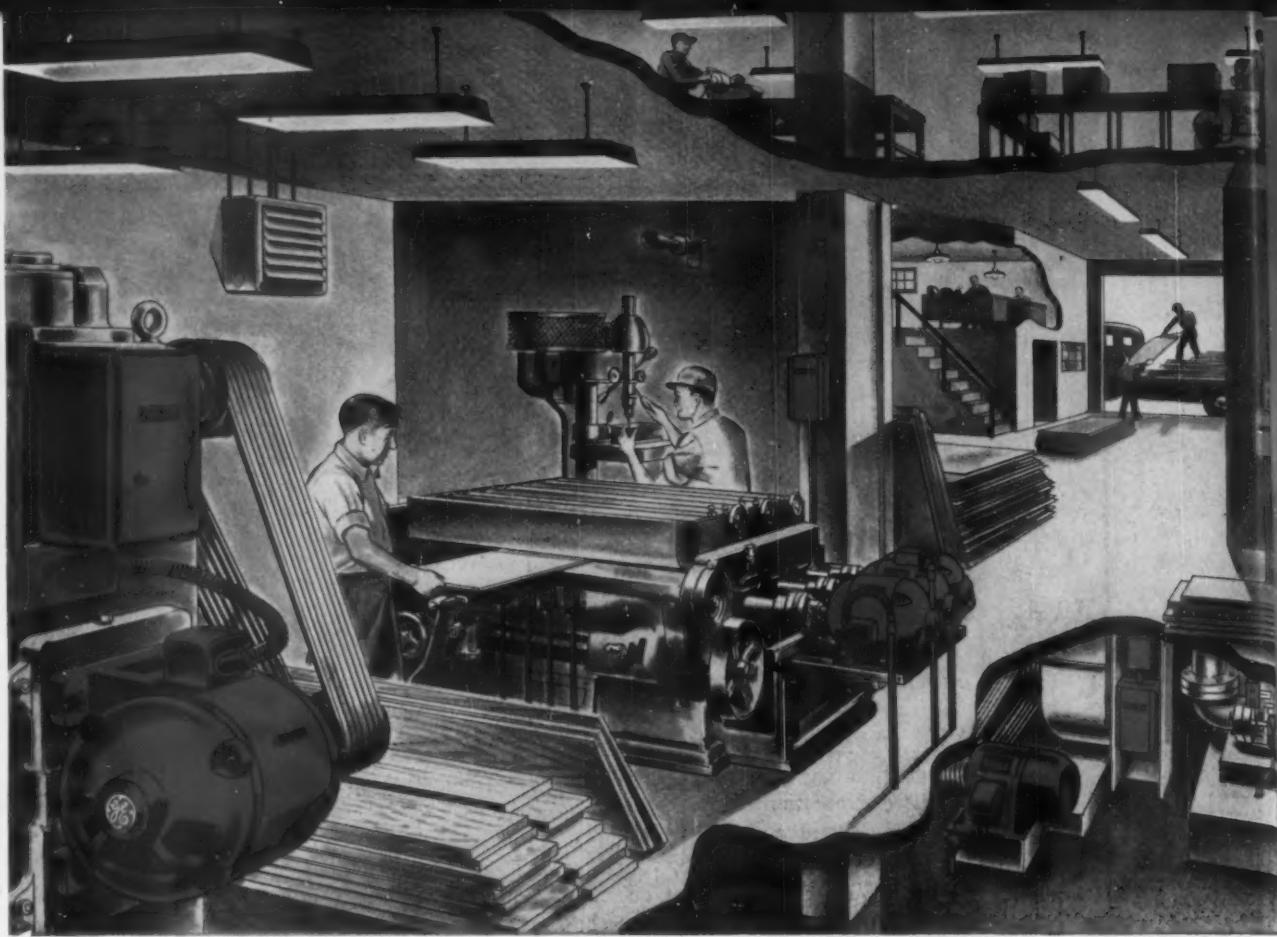
Yet these are matters which should not concern him at all. And, let's face it, they never will.

There is no technical reason why electrical contractors cannot install residential electrical systems fully capable of serving any probable utilization needs for 10 years. To guarantee full performance over that period would involve some risk. But superior design could easily reduce the risk to negligible proportions. If optimum standards were met by the contractor it would be entirely feasible for industry associations to underwrite the guarantee.

Performance guaranteed residential electrical systems would take decisions on the obscure technology of our industry out of the hands of home buyers, architects, builders and bankers and place the responsibility right where it belongs—in the electrical industry. And for a major act of responsibility the electrical contractor should expect, and get, a substantial price.

Wm. T. Stuart

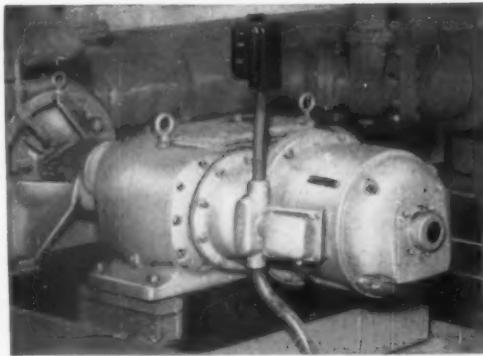
Preliminary discussions of this proposal have aroused not only interest but considerable enthusiasm. Your comments will be cordially welcomed.



POWER — WHEN AND WHERE IT'S NEEDED. Smooth, steady power for any production line begins when you install Graybar-distributed G-E motors and controls. AC or DC . . . general- or special-purpose, G-E Tri-Clad motors offer your

customers extra protection against physical damage, electrical breakdown, and operating wear. Given ordinary care, you can count on G-E motors for dependable service under even the toughest operating conditions.

This team pays off in performance



MATCHING G-E MOTOR CONTROLS give full protection against injurious overloads . . . provide maximum flexibility of motor operation. All live parts are completely enclosed, yet cases are easily accessible and have ample conduit knock-outs and terminals for easy installation.

General Electric Tri-Clad motors and matching G-E controls make a hard-to-beat production team. Your customers get reliable, uninterrupted performance shift-after-shift — a practical defense against downtime due to motor failure.

Graybar distributes the complete line of G-E motors and controls. Your local Graybar Representative can help you select the proper equipment for any machine-drive requirement . . . help you analyze special service conditions that demand totally-enclosed motors, variable-speed motors, gear motors, or reversible motors.

Graybar can furnish you and your customer with practical advice on the installation and usage of over 100,000 different electrical items. For help in speeding lighting, communication, ventilation and wiring projects of all types, call our nearest office. *Graybar Electric Co., Inc. Executive Offices: Graybar Building, New York 17, N. Y.*

246-43

Call Graybar first for...



Design Aids for

Residential Electrical Systems

THE new functional approach to residential electrical system design and layout involves an analysis of probable loads and the selection and application of "preferred" circuits and services. If lighting and appliance loads are correctly anticipated, the capacity of system elements are reasonably assured.

In principle, functional design provides unrestricted use of the electrical system by the home owner. No probable connection or use should overload any part.

Since few, if any, of the home utilization devices or equipments are actually installed or connected at the time of building, "code" requirements provide no substantial protection for the owner against early obsolescence and relatively expensive replacement and modification of the wiring system as appliances are purchased.

The major characteristics of merit of residential systems are accessibility, capacity, isolation, safety and control. Functional design provides all of these characteristics.

Capacity, isolation and safety are technical characteristics which can be appraised only by experts. Safety is usually policed by building codes. Adequate system capacity and circuit isolation depend largely upon the responsibility of the builder and the electrical contractor.

In many communities industry groups (Adequate Wiring Bureaus) offer free wiring advice and system layouts. A feature of this service is a certificate of wiring adequacy, which is reliable assurance of sufficient capacity.

The following spread presents a new chart for selecting outlets and circuits in terms of the anticipated loads.

By checking the appliances and lighting to be provided for, the preferred circuit and the type of outlet may be read from the chart.

Circuits are rated for loading not exceeding 80% of maximum safe circuit capacity.

The number, type and location of outlets determine the accessibility and convenience of the electrical system. The circuit layout determines the capacity or capability of the system to supply uninterrupted, efficient service to any probable combination of loads which may be connected.

Each circuit must provide for the maximum probable load it will serve plus a 20% safety margin. The *normally connected* load on a general purpose circuit, lights and portable appliances, should not exceed 50% of the rated capacity in order to provide sufficient extra capacity for the temporary attachment of other portable appliances. For example, a bedroom outlet must be able to handle an extra 1000-watt load from an electric iron or a 600-watt vacuum cleaner.

The '54 balance sheet of residential electrical systems



60 ampere barrier broken

Switching improving

More full circuits

Sharp gain for residential air conditioning

New built-in lighting techniques

Built-in appliances

Poor anticipation of conventional appliance loads

Too few circuits

Too little light

Too few underground services

Load center distribution lacking

Not enough "spare" capacity

System Characteristics of Merit

ACCESSIBILITY Outlets for utilization must be numerous and located where they are most convenient and useful for the purposes they serve.

CAPACITY All parts of the system must be capable of supplying rated utilization voltage under full load. No probable connection or use of normal devices should cause an overload on any part of the system.

ISOLATION Automatic appliances must be served by circuits which cannot be interrupted by overloads or faulty portable equipment or cords. Lights, television and other equipment sensitive to voltage fluctuation should not be served by circuits to which motor driven or automatic appliances are connected.

SAFETY The system must be safe and secure and present no hazards to the user or the home.

CONTROL The electrical system must provide maximum operating convenience for all normal conditions.

Electrical Construction and Maintenance

LOAD and CIRCUIT CHART for RESIDENTIAL ELECTRICAL SYSTEMS

	Typical Load in Watts	Preferred Type of Circuit	Volts	Wires	Circuit Breaker or Fuse	Number of Outlets	Typical Outlets	Notes
KITCHEN								
RANGE	12000	10 KW.	120/240	3- #6	50-60A.	1		Use of more than one outlet is permitted, but not recommended.
OVEN (Built in)	4500	6 KW.	120/240	3- #10	30A.	1		Appliance may be direct connected.
RANGE TOP	6000	6 KW.	120/240	3- #10	30A.	1		Appliance may be direct connected.
RANGE TOP	3300	4 KW.	120/240	3- #12	20A	1 or more		
DISHWASHER	1200	2 KW.	120	2 #12	20A.	1		
WASTE DISPOSER	300	2 KW.	120	2 #12	20A.	1		These appliances may be direct connected on a single circuit. Grounded receptacles required, otherwise.
BROILER	1500	2 KW.	120	2 #12	20A.	2 or more		
FRYER	1300	2 KW.	120	2 #12	20A.	2 or more		Heavy duty appliances regularly used at one location should have a separate circuit. Only one such unit should be attached to a single circuit at a time.
COFFEEMAKER	1000	2 KW.	120	2 #12	20A.	2 or more		
REFRIGERATOR	300	2 KW.	120	2 #12	20A.	2		Separate circuit serving only refrigerator and freezer is recommended.
FREEZER	350	2 KW.	120	2 #12	20A.	2		
LAUNDRY								
WASHING MACHINE	1200	2 KW.	120	2 #12	20A.	1		Grounding type receptacle required.
DRYER	5000	6 KW.	120/240	3 #10	30A.	1		Appliance may be direct connected — must be grounded.
IRONER	1650	2 KW.	120	2 #12	20A.	1		Grounding type receptacle required.

LAUNDRY

Appliance may be direct connected — must be grounded.

DRYER	5000	6 KW.	120/240	3 #10	30A.	1			
IRONER	1650	2 KW.	120	2 #12	20A.	1			
HAND IRON	1000	2 KW.	120	2 #12	20A.	2 or more			
WATER HEATER	3000								Consider possible use in other locations.
WORKSHOP	1500	2 KW.	120	2 #12	20A.	2 or more			Separate circuit recommended.
PORTABLE HEATER	1300	2 KW.	120	2 #12	20A.	1			Should not be connected to circuit serving other heavy duty loads.
TELEVISION	300	2 KW.	120	2 #12	20A.	2 or more			Should not be connected to circuit serving appliances.
PORTABLE LIGHTING	1200	2 KW.	120	2 #12	20A.	2 or more			Provide one circuit for each 500 sq. ft. Divided receptacle may be switch controlled.
FIXED LIGHTING	1200	2 KW.	120	2 #12	20A.	2 or more			Provide at least one circuit for each 1200 watts of fixed lighting.
AIR CONDITIONER $\frac{3}{4}$ H.P.	1200	2 KW.	120	2 #12	20A.	1 or more			Consider 4 kw 3-wire circuits to all window or console type air conditioners. Outlets may then be adapted to individual 120 or 240 volt machines.
AIR CONDITIONER $1\frac{1}{2}$ H.P.	2400	4 KW.	120/240	3 #12	20A.	1 or more			
CENTRAL AIR CONDITIONER	5000	6 KW.	120/240						Consult manufacturer for recommended connections.
SUMP PUMP	300	2 KW.	120	2 #12	20A.	1 or more			May be direct connected.
HEATING PLANT	600	2 KW.	120	2 #12	20A.	1			Direct connected. Some local codes require separate circuit.
BATHROOM HEATER	1500	2 KW.	120	2 #12	20A.	1			Direct connected.

LIVING AREAS

LAUNDRY						
DRYER						
IRONER						
HAND IRON						
WATER HEATER						
WORKSHOP						
PORTABLE HEATER						
TELEVISION						
PORTABLE LIGHTING						
FIXED LIGHTING						
AIR CONDITIONER $\frac{3}{4}$ H.P.						
AIR CONDITIONER $1\frac{1}{2}$ H.P.						
CENTRAL AIR CONDITIONER						
SUMP PUMP						
HEATING PLANT						
BATHROOM HEATER						

FIXED UTILITIES

LAUNDRY						
DRYER						
IRONER						
HAND IRON						
WATER HEATER						
WORKSHOP						
PORTABLE HEATER						
TELEVISION						
PORTABLE LIGHTING						
FIXED LIGHTING						
AIR CONDITIONER $\frac{3}{4}$ H.P.						
AIR CONDITIONER $1\frac{1}{2}$ H.P.						
CENTRAL AIR CONDITIONER						
SUMP PUMP						
HEATING PLANT						
BATHROOM HEATER						

Residential Wiring (continued)

KW RATED SERVICE ENTRANCES

		Mains		Service Wire Size	
10 kw	General Purpose	12,000 watts Maximum Capacity	60 A Sw. or 50 A Cir. Bkr.	2-No. 6 1-No. 8	1" Conduit
20 kw	General Purpose, Electric Cooking, Electric Laundry, Water Heater	24,000 watts Maximum Capacity	100 A Sw. or 100 A Cir. Bkr.	2-No. 2 1-No. 4	1 1/4" Conduit
30 kw	General Purpose, Electric Cooking, Electric Laundry, Central Air Conditioning, Water Heater	36,000 watts Maximum Capacity	200 A Sw. (150 A Fuses) or 1-No. 2 150 A Cir. Bkr.	2-No. 2/0 1-No. 2	2" Conduit
40 kw	General Purpose, Electric Cooking, Electric Laundry, Central Air Conditioning, Water Heater, Supplementary Home Heating (in temperate climate)	48,000 watts Maximum Capacity	200 A Sw. (200 A Fuse) or 1-No. 2/0 200 A Cir. Bkr.	2-No. 4/0 1-No. 4	2" Conduit

Diagrams illustrating service entrance connections:

- 10 kw General Purpose:** A single 50A main switch is connected to a power center, which then feeds a 1" conduit to the house.
- 20 kw General Purpose, Electric Cooking, Electric Laundry, Water Heater:** A main switch (No. 2) is connected to a 50A main switch, which then connects to a power center. The power center feeds a range and a water heater. A 20kw service entrance is shown.
- 30 kw General Purpose, Electric Cooking, Electric Laundry, Central Air Conditioning, Water Heater:** A main switch (No. 2/0) is connected to a 50A main switch, which then connects to a power center. The power center feeds a range and a water heater. A 30kw service entrance is shown.
- 40 kw General Purpose, Electric Cooking, Electric Laundry, Central Air Conditioning, Water Heater, Supplementary Home Heating (in temperate climate):** A main switch (No. 4/0) is connected to a 50A main switch, which then connects to a power center. The power center feeds a range and a water heater. A 40kw service entrance is shown.

A practical method of computing residential service entrance capacity is provided by Article 220 of the National Electrical Code. However, it is based on safety considerations and may not provide the adequacy and convenience of performance desired.

1. Calculate the lighting load—in watts—by multiplying the square foot of floor area (excluding porches, etc.) by 3 watts/sq. ft.
2. Add 1,500 watts of miscellaneous appliance load.
3. Take 3,000 watts of the total (1 and 2) at 100% demand.
4. Add to this 35% (demand) of the remainder.
5. This (total of 3 and 4) is the design lighting and small appliance load.
6. Add 8,000 watts for an electric range (not over 12 kw rating).
7. Add together the rated watts of all fixed appliances.
8. Take 75% (diversity) of the total fixed appliance load and add it to the range, lighting and small appliance loads. This is the total loads in watts.
9. Divide this grand total by 240 (for 120/240-volt, 3-wire service) to get the ampere rating of the service conductors.

With the increase in the variety and wattage rating of the so-called "small" appliances the 1,500 watts of miscellaneous appliance load (Step 2) should be increased. Also, some designers argue that automatic fixed appliances should be calculated at full demand and not subject to the 75% demand.

Typical power center and circuit requirements

6 room house 1500 sq. ft.

20-kw service	main	100 amp	3w	240/120 volts
10-kw range	1-10 kw	50 amp	3w	240/120 volts
3-kw water htr.	1-6 kw	30 amp	3w	240/120 volts
5-kw dryer	1-6 kw	30 amp	3w	240/120 volts
1 1/2-hp cooler	1-4 kw	20 amp	2w	240 volts
clothes washer	1-2 kw	20 amp	2w	120 volts
ironer	1-2 kw	"	"	"
dish washer	1-2 kw	"	"	"
oil burner	1-2 kw	"	"	"
freezer—ref.	1-2 kw	"	"	"
heater	1-2 kw	"	"	"
T.V.	1-2 kw	"	"	"
general purpose	4-2 kw	"	"	"
portable app.	3-2 kw	"	"	"

ASSEMBLY LINE ESTIMATING

ONE mechanic, repeating the same operation, is more productive than another occupied with an entire process. Application of this concept to residential construction is now a standard practice.

Obviously, this calls for development of new labor units and modification of the estimating technique.

Controlling Factors

Two conditions affect the extent to which assembly line techniques can be used to cut costs:

1. On smaller projects the quantity of work will determine the number of operations which may be assigned to individual teams and, moreover, will probably preclude investment in special tools and rigs.

2. The effectiveness of the assembly line method in reducing costs is a function of quantity—unit cost on 5,000 similar operations will be lower than the cost for 50. This is because efficiency increases with repetition and write-off of production equipment is spread more thinly.

Older Methods Fail

Normal estimating procedure breaks up the job into the various components of the electrical system—service, feeders, panels, circuit wiring etc. Each component is then itemized and labor costs assigned to the appropriate item of material.

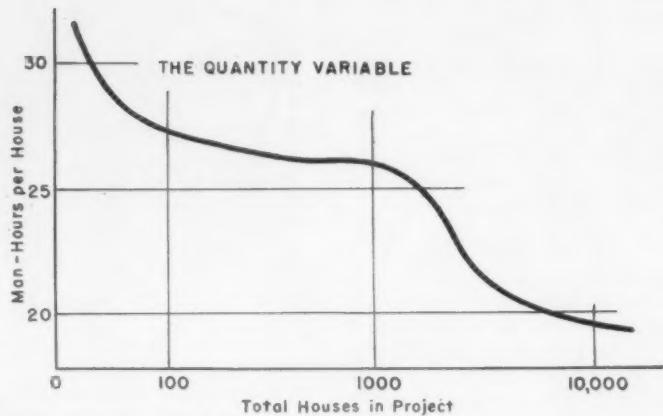
This system will not give a true picture for mass production work since labor for a single item of material may be derived from three or more completely unrelated operations. For example, a service mast will be (1) assembled at a field work shop, (2) transported to installation point, (3) mounted and (4) connected.

Moreover, the regular estimating method does not permit evaluation of the quantity variable—the second controlling factor mentioned above.

Costs can be accurately gaged by the "Assembly Line" estimating method.

The New Approach

In assembly line estimating, a job plan is devised to show each step, each process involved in the job. Labor for each process is calculated and material is then assigned to the pertinent process. To illustrate, a project of 1,500 identical houses might be set up in this manner:



LABOR COSTS DECLINE as the size of the residential job increases. Significant decline between zero and one hundred units is the result of lower losses from stoppages and opportunity to use basic mass production techniques. Decline after one thousand reflects specialization of labor force.

1. Preassembly at field shop.
 - 1,500 Service masts with meter pans attached.
 - 9,000 Ceiling boxes with bar hangers.
 - 1,500 Roughing kits—
(Service equipment, panel, outlet boxes and cable.)
 - 1,500 Finishing kits—
(Wiring devices, plates, fixtures and lamps.)
2. Deliver 3,000 kits to installation sites.
3. Mount and connect 1,500 service equipments and panels.
4. Locate and mount outlets—32 per house.
5. Drill studs and run cables—380 ft. per house.
6. Splice circuit wiring.
7. Miscellaneous wiring—
(Oil burner, range, doorbell.)
8. Finishing—23 wiring devices and 9 fixtures per house.

Note: Transportation is minimized by assembling kits which contain the exact material required for each house.

Labor for each step is now calculated according to the nature of the operation.

Preassembly

The estimate of labor involved in the field shop work (step 1) must begin with *exact* determination of assembly time for one unit. One minute rate change for assembling 1,500 service masts amounts to 25 man-hours.

Time-study tests or experience rec-

ords are the best means of establishing these labor rates. Good results may be achieved, however, by a detailed analysis of the operation:

Assemble 1,500 ten-foot service masts with meter pans—one man.	
1. Place two 1-in. EMT connectors on a length of conduit	112 seconds
2. Place service cap (less cover) on conduit	32 "
3. Push through three 13-ft. pieces of No. 6 wire	49 "
(using multiple reel rack)	
4. Skin three wire ends (using wire stripper)	48 "
5. Connect socket type meter pan to conduit	75 "
6. Three terminal connections at meter block	92 "
7. Place cover on service cap	32 "

440 seconds

or 7.33 min. each

This analysis does not allow for material handling, setting up special rigs, retooling, rectifying errors, rest periods, and personal lost time. Final labor units are developed by applying these increments at the time level where they may best be determined.

Rest periods, for example, are adjudged to take about nine minutes out of each man-hour. This leaves 51 working minutes.

51 minutes/hour \div 7.3 minutes/unit
 \equiv 7 units per hour.

Residential Wiring (cont.)

In the same manner, if personal lost time and rectifying errors will occupy 45 minutes of each day, then the effective working day is $7\frac{1}{2}$ hours and:
 $7\frac{1}{2}$ hours \times 7 units/hour

$$= 50.8 \text{ units per day}$$

Applying other losses at the work-week or total-operation level, whichever is applicable, the true labor cost of this one item is determined.

Tool costs may be entered here but material costs are better assigned to the "roughing kit" item.

The Installation Steps

Operations No. 4 through No. 7 in the job plan, being more complex processes, do not lend themselves to such detailed analyses as are possible with the "preassembly" items. On the other hand, the margin of error is measured in hours, not seconds.

This is because the basic work unit for these operations is a *house*. Locating and mounting outlets, for example, is estimated in terms of so many man-hours for all the outlets in one house.

For an effective, experienced organization, labor for the sample project—1,500 six room homes—would be:

	man-hrs. per unit
Mount and connect service equipment and panel	1.4
Drill studs and run cable—380 ft. No. 12 BX	9.0
Locate and mount outlets—32 per unit	2.5
Splice circuit wiring and connect to panel	2.6
Miscellaneous wiring—oil burner, range, doorbell	3.7
Finishing—23 wiring devices and 9 fixtures	4.8
<hr/>	
Total man hrs.	24.0

With the inclusion of preassembly and delivery labor, total estimated labor per house is 25.5 man-hours.

Check Points

It must again be emphasized that the size of the job is a most important factor in residential work, for it governs the degree to which mass production techniques can be applied. Any consideration that might conceivably retard the steady progress of the work must be studied. The general contractor, the climate, the housing market are a few of the principal ones.

Assembly line estimating will accurately reflect the efficiency of new work methods.



THE RESIDENTIAL MARKET

This year residential wiring will account for 25% of all electrical work. But despite this, techniques of design, installation, and estimating in this field lag behind the advances made through the rest of the industry.

This situation presents a tremendous opportunity to the contractor who can develop more efficient methods of house wiring—higher efficiency means lower costs, and lower costs mean more work.

Volume, however, is not the real measure of success. In any contracting business, estimating cost is a prime factor in determining profit, and *profit* is the true gage of achievement in industry. The contractor who can not accurately evaluate the effectiveness of his organization, particularly the field force, faces certain disaster either from bidding too high or too low.

The first step in any business venture is to analyze the market. What is the sales potential? How is the company equipped to compete in this field?

Since the end of World War II, specialization has become an important factor in residential wiring. Many contractors have found that by limiting operations to just one aspect of the field, they can increase efficiency.

Residential work may be listed under three headings. Each of these requires special equipment and work techniques.

1. LARGE DEVELOPMENTS

Jobs in this classification consist of fifty or more houses, usually of identical design. Competition is extremely sharp. Extras are rare.

Substantial savings are accomplished in the type of work by the application of assembly line production methods. Every detail of the operation must be carefully plotted in advance. Top grade supervisory personnel should be maintained at the job site.

2. CUSTOM BUILT HOUSES

These units are generally built to order with numerous variations from the builder's plan to suit the individual buyer. The contractor has a good opportunity to sell additional electrical equipment, even appliances.

The smaller size of these jobs—usually from one to twenty houses—makes costs higher and more difficult to control. Work progress is slow and often stopped completely. The key to efficiency in this field is to maintain a large enough volume of work to absorb the shock of stoppages on any project.

3. MAINTENANCE

Modernization and repair is the fastest growing part of the residential market. Twenty-five million American homes need some degree of electrical modernization today. Record appliance sales will increase the need.

This type of operation relies upon competent and trustworthy mechanics, a well-trained office staff, and an effective communications system. Overhead is of necessity a costly item in any service organization. Transportation, paper work and advertising account for a large portion of it.

Thus, each type of residential work has different sales possibilities, one of which will be best suited to the individual contractor's set-up.

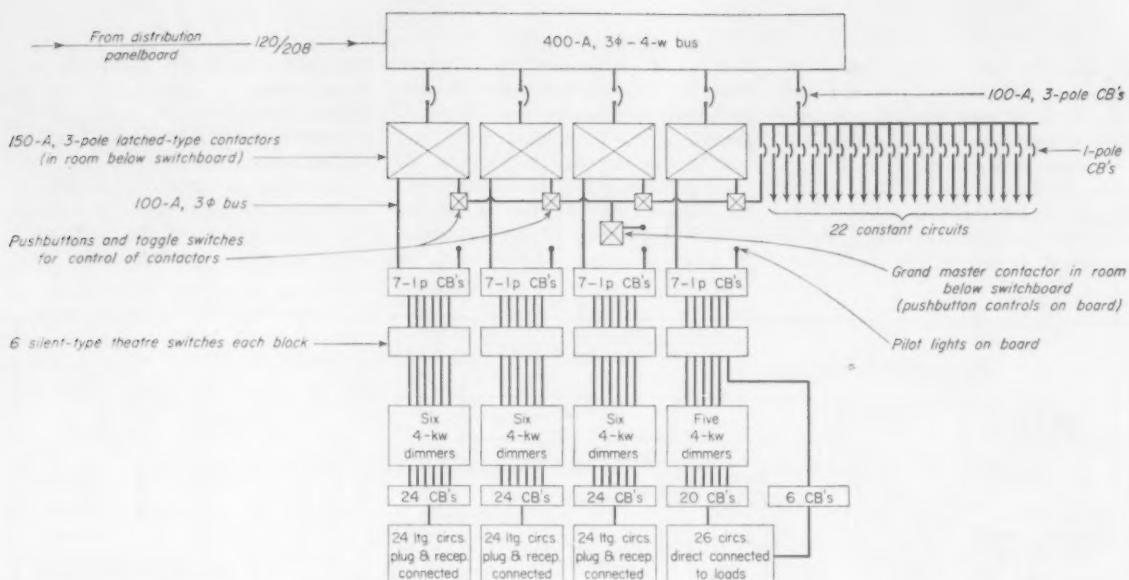
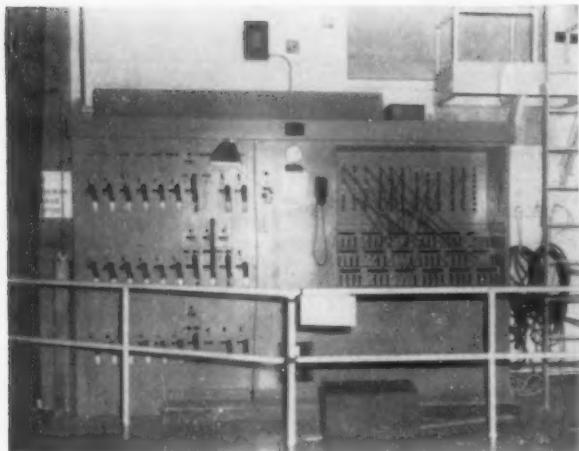


FIG. 1. Block diagram of the complete assembly shows independent sequence of four feeds to dimmer-controlled circuits and the feed to constant circuits, with contactors supplied from constant-circuit CB panel.

Wiring a Stage Switchboard



SWITCHBOARD ENCLOSURE is located against forward wall of backstage area, near edge of stage; is supplied from below by four No. 4/0's in 3-inch conduit from distribution panelboard in transformer room.

AMODERN switchboard today provides full and flexible control of stage lighting in the auditorium in the new wing of Abraham Lincoln High School, San Francisco. Although only a small part of the overall electrical job in the new building,

wiring of this board presents a clear study in the details of stage lighting control circuiting.

At Lincoln High, the switchboard is installed against a backstage wall, close to the front side of the stage. The complete unitized assembly of con-

Hookup and operating details of a stage lighting switchboard, installed by Abbott Electric Company, Electrical Contractors, in the modern auditorium of the new wing of Abraham Lincoln High School, San Francisco, Calif.

By J. F. McPartland

trol devices is supplied at 120/208 volts, 3-phase, 4-wire. A run of 3-inch conduit carries four No. 4/0 TW conductors directly to the unit from a main distribution panelboard in one of the school's load center transformer rooms. Within the switchboard en-

closure, the four supply conductors connect to 400-ampere, 3-phase, 4-wire bus. Both dimmer circuits and constant circuits are fed from this bus.

A clear understanding of the circuitry in the switchboard can be had by considering the various block elements of the assembly. Fig. 1 shows the overall hookup of the board. The

flow of utilization current is traced from the 400-amp bus down through each latched-type contactor, CB panel, theatre switches, dimmer bank and out to the circuits. As shown, 22 constant circuits are fed directly from the 400-amp bus. Of the 92 dimmer controlled circuits, 72 are completed by plug connection to receptacles on

the right side of the board; 20 are direct connected through CB's to the loads. There are 24 spare circuit provisions in the plug-receptacle panel on the board.

Circuiting of controls provides a wide range of operations. Fig. 2 shows the actual wiring of the contactors. For simplicity, only three of the feeds

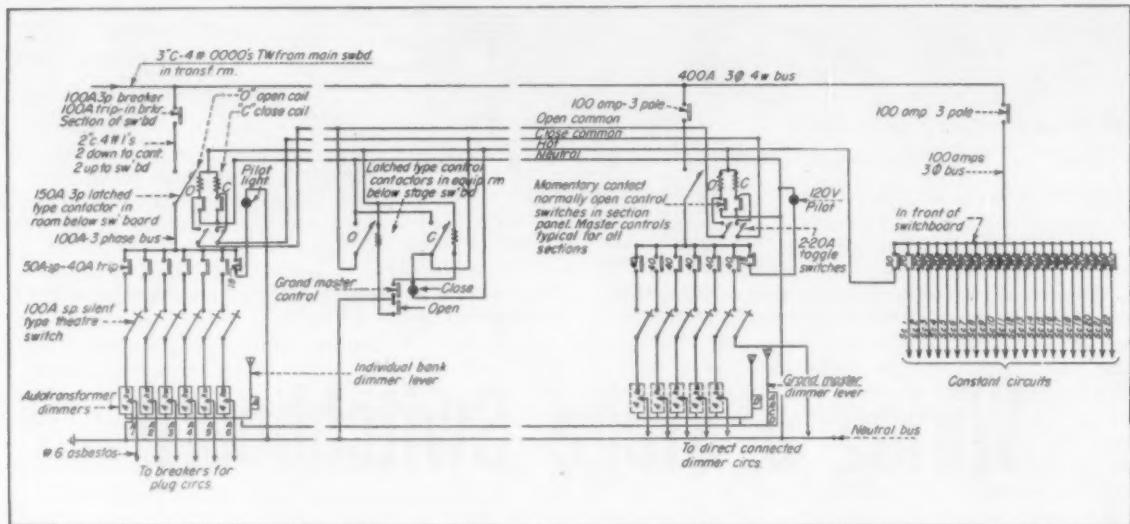


FIG. 2. Control wiring of section of the switchboard shows individual contactors for two dimmer banks and the grand

master contactor, with associated pushbuttons, toggle switches and pilot lights.

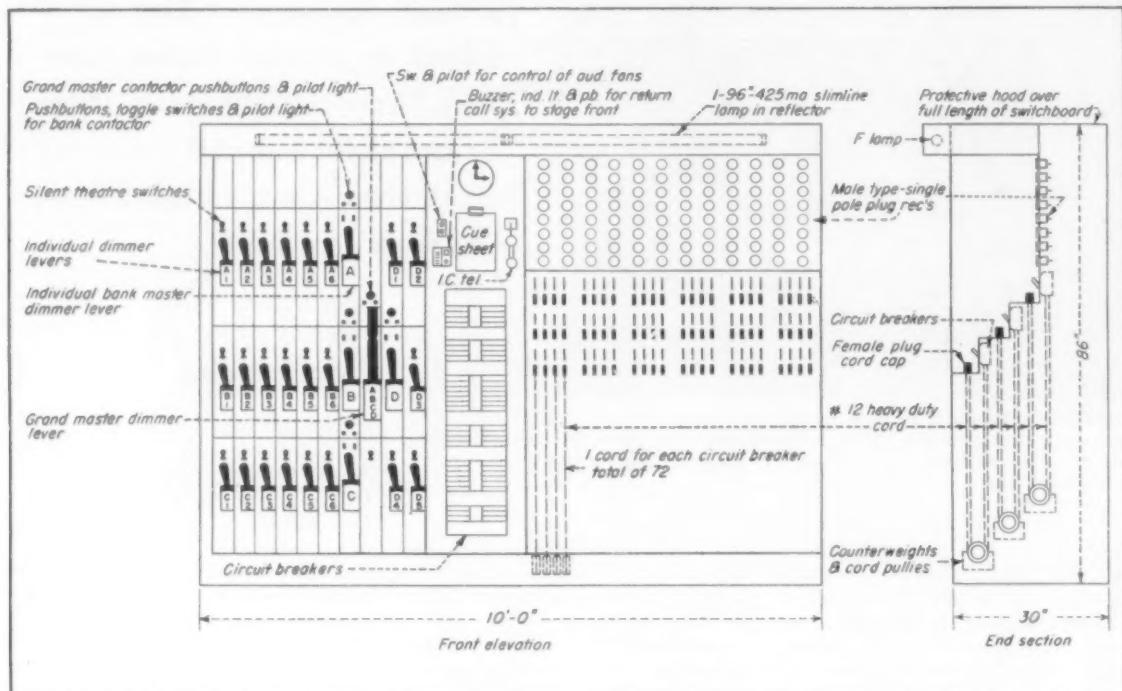


FIG. 3. Front and end elevations of the assembly, with dimmer levers and switches at left and plug-circuit panel at right.

from the 400-amp bus are shown. A latched-type contactor in the line to each dimmer bank has separate "open" and "close" coils which are energized from the constant-circuit panel. Separate return lines for the coils in each contactor are made common with master "open" and "close" contactors. Each dimmer-bank contactor can be opened or closed by momentary contact pushbuttons which complete the hot sides of the coil circuits to neutral. Two 20-amp toggle switches can be closed to short out the pushbuttons and throw control of the contactor over to the grand master contactor. The master contactor has an "open" and a "close" pushbutton to close circuits to its actuating coil. As shown, the contacts in the master unit complete the circuits of the coils in the dimmer-bank contactors—only, of course, when the toggle switches are closed in the bank contactors. All of the contactors are located in an equipment room below the switchboard, with their associated pushbuttons, toggle switches and pilot lights mounted on the front of the switchboard.

Dimmer Operation

Dimmer controls are operated by mechanical operation of the handles on the front of the switchboard, Fig. 3. Units marked "A1"—"A6" provide individual control of each of the six dimmers. ("A1"—"A6" in Fig. 2) in one bank. The lever marked "A" provides master control of dimmer settings for the entire bank. Each of the other dimmer banks has similar control. A grand master dimmer lever (marked "ABCD" in Figs. 2 and 3) is mechanically coupled to the master dimmer levers for each of the four banks—"A", "B", "C" and "D". Silent type theatre switches are used as disconnects for the individual dimmers.

A section of the dimmer supply to the plug-and-receptacle circuits on the board is shown in Fig. 4. From the six dimmers in bank "A", No. 6 asbestos covered conductors tie in to six groups of four CB's. The hot side of each of 24 circuits is then carried to a terminal post to which a plug cord is connected. The hot side of each circuit can be connected to one of the receptacles on the board. Neutral conductors for these lighting circuits are taken from a neutral bus, as shown. Arrangement of plugs and receptacles are shown at right in Fig. 3. From 3 of the 4 dimmer banks, a total of 72 plug circuits serve house lighting spots, border lights and footlights.

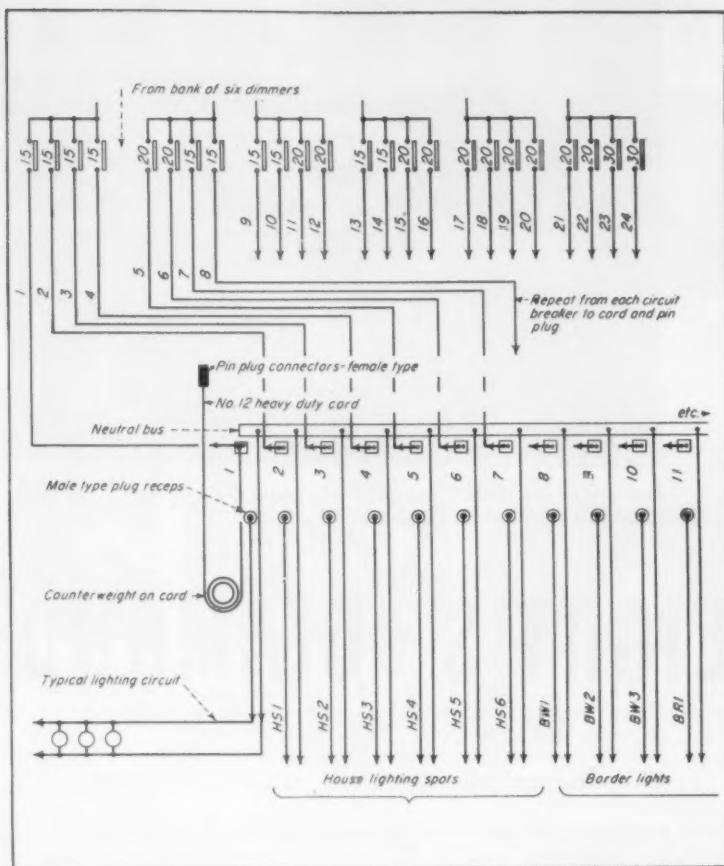


FIG. 4. Section of circuit wiring for plug circuits shows 24 hot wires supplied from one bank of dimmers, neutral bus and circuit arrangement of plugs and receptacles.

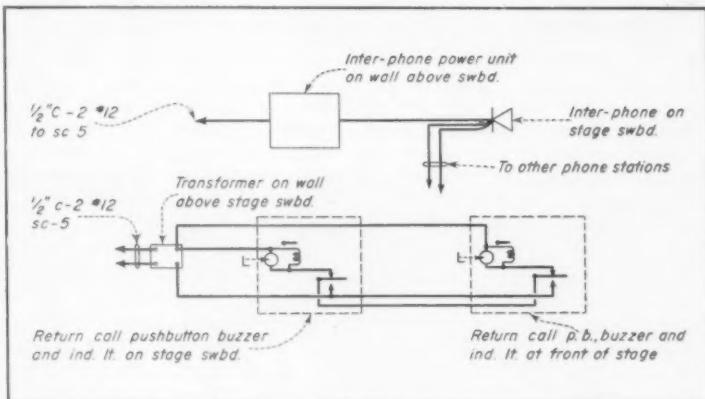
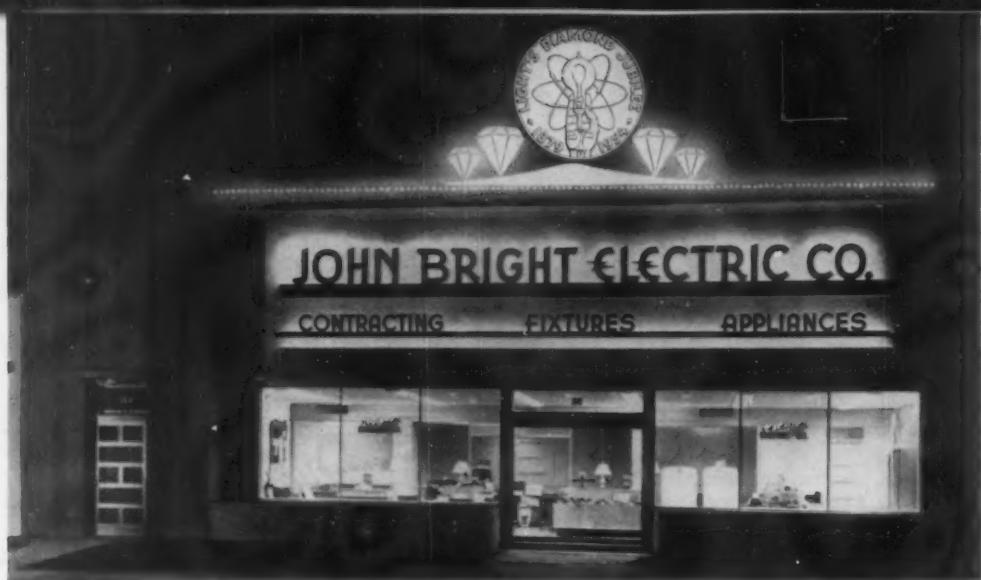


FIG. 5. Interphones and power unit, return call pushbuttons, buzzers and indicator lights are supplied from constant-circuit CB panelboard.

Inter-phone, buzzer and indicator lights are part of the switchboard circuitry. Fig. 5 shows the basic arrangement, supplied from circuit SC-5 on the constant-circuit CB panel. Fig. 3 shows the location of accessories on

the switchboard. These include: call system controls, electric clock, intercom telephone, buzzer and indicator lights and a protective hood over the board with one 96-inch T-12 slimline fluorescent lamp.



Electrical contractor lights up, spearheads local celebration of . . .

LIGHT'S DIAMOND JUBILEE

A round-up of ideas for fittingly symbolic luminous displays which may be used by municipalities, local communities, commercial and industrial organizations and others in commemoration of Light's 75th Anniversary.

LIIGHT'S Diamond Jubilee will be celebrated this year in more than 1000 communities throughout the nation. Celebrations will be held on both the local and the national level, building to a climax in October. This Jubilee commemorates the 75th Anniversary of Thomas A. Edison's invention of the first practical incandescent lamp on October 21, 1879, and the 75 years of rapid electrical progress since that invention.

National Jubilee events will be sponsored by all segments of the electrical industry, and will provide a background against which community Jubilee celebrations will have added meaning. Included will be reports on 75 years of electrical progress and on the industry's future development culminating in an outstanding two-hour television show telecast over three net-

works on October 21, 1954.

Local celebrations of the Jubilee will be promoted by electric light and power companies, in cooperation with all possible community organizations, both electrical and non-electrical. They will feature what electrical progress means to the average American.

What can be done at the local level to tell the Jubilee story most effectively? How can local community displays be developed, promoted, and sold, and who's to do this job? Since most displays will involve lamps, light, and wiring, the electrical contractor will be a key figure in this program and is the logical one to do the job. It is on this premise that the ideas presented here have been developed and are published for his benefit and use.

Here's how every electrical con-

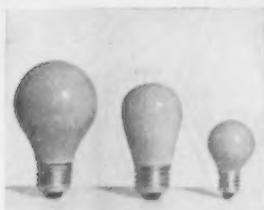


tractor can contribute to the success of local Jubilee plans. First, he should contact his local power company and determine who is chairman of the local Jubilee program. He should then contact this local chairman, offer his services, learn what is being planned, and what he can do to promote this program most effectively. He can then gear his activities to these plans accordingly.

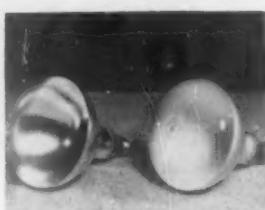
The electrical contractor can quickly establish his identity with the Jubilee by designing and installing an appropriate symbolic luminous display on his own building. He should then contact his regular customers and offer them ideas for luminous displays which he can provide as a tie-in with local celebration plans. He may also use this opportunity to call on and develop new customers.

Typical Lamps and Accessories for Luminous Displays

Use These Lamps . . .



Enamel coated lamps in 10 and 25 watt sizes, available in white and nine colors.



Reflector spot and flood lamps, 150- and 300-watt sizes, 150-watt size in six colors.



PAR-38 150-watt spot and flood lamps, color lenses and holders available.

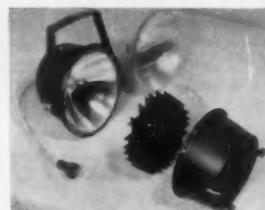


Projector lamps with side or end prong bases, in 150-, 200- and 300-watt sizes.

Use These Accessories . . .



PAR-38 lamp, adjustable holder, color lens holder and four color lenses. Spot and flood lamps available.



Typical holder for 300- and 500-watt PAR lamps, louver and metal shield with color clips.

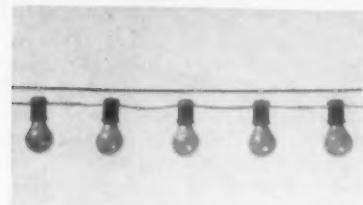


Weatherproof cast housing holder and heat resisting 300- or 500-watt R lamps, useful for floodlighting.

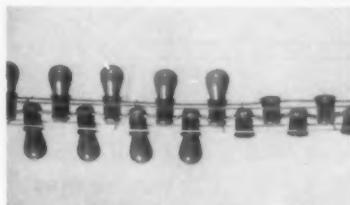


Typical cast holder for 500-watt PAR-56 lamp. Cover glass protects lamp, may be clear or colored.

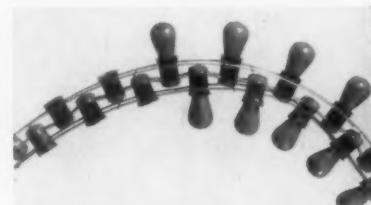
Bare Lamp Streamers



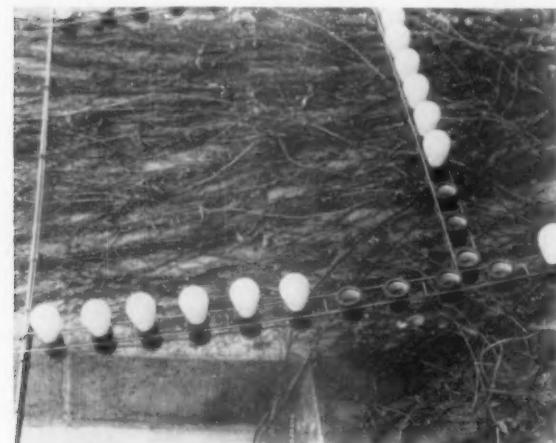
Festoon can be supported to messenger cable with hooks, taking strain off electric wiring.



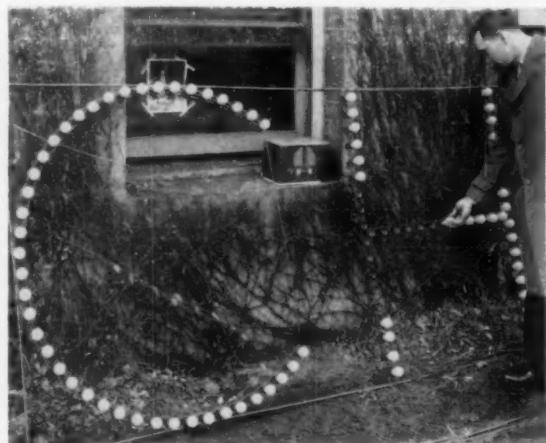
Wide line of light is produced by double row of sockets, assembled on wire frames, easily welded in shape desired.



Curved letters or designs with curved sections are made by bending wire frames to desired shape.

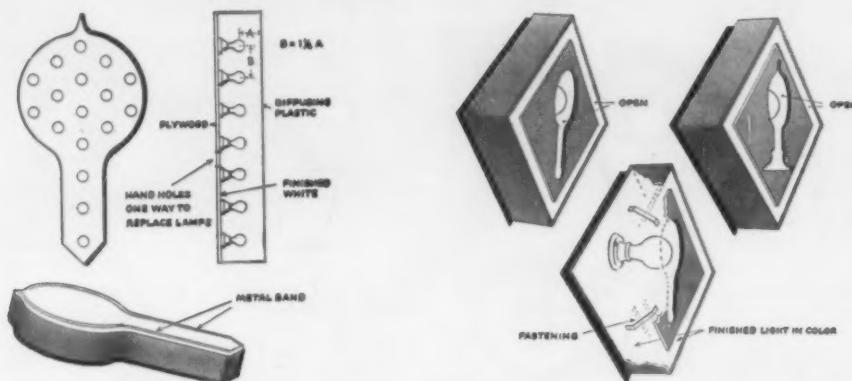


Rigid wire frame designs may be fabricated and assembled in shop or on ground, taken to job ready for installation.



Complete assembly can then be mounted in place desired and supported on suitable framework.

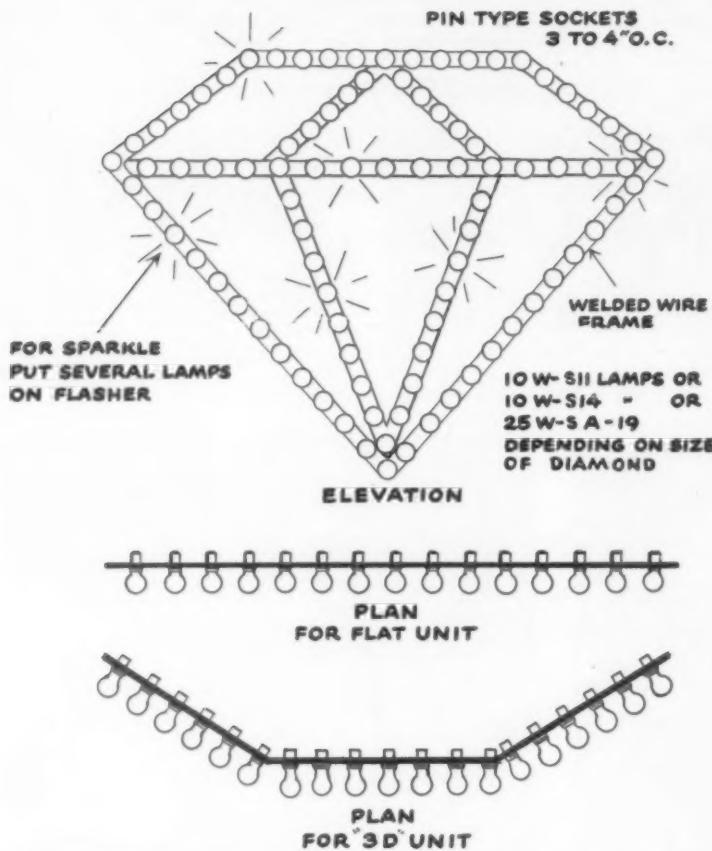
(continued)



ELECTRIC LAMPS

Lamp and diamond shapes are effectively symbolic for attractive and decorative luminous elements for use in Jubilee displays. Old and new lamp shapes are shown above left, while lamp cutout is combined with diamond shape in example at right.

Symbolic Elements for Luminous



HIGH BRIGHTNESS DIAMOND

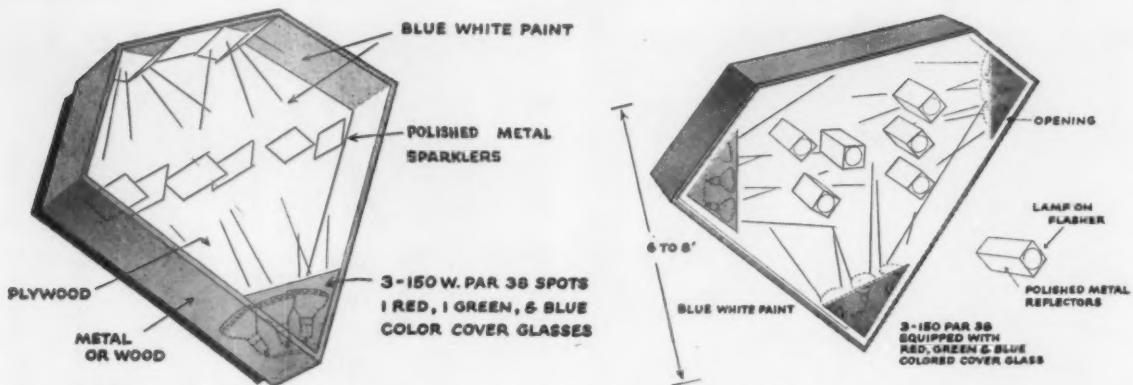
Flat or 3-D diamond shape can be made in outline with welded wire frames and lamp sockets. Clear daylight lamps give diamond effect.

UMINOUS elements, made up to simulate diamonds and electric lamp bulbs in shape and outline, are fittingly symbolic of the 75th anniversary of Edison's first electric lamp. These, and replicas of the official emblem adopted for Light's Diamond Jubilee, will appropriately key most displays made to commemorate this anniversary. Typical examples of these elements are illustrated on these two pages, so designed that they can be made up locally by an electrical contractor, using materials that are readily available.

The type and size of the display design, its location, average viewing distance, and similar factors will govern the type and size of elements which should be used. Examples of display designs suggested and shown on the following pages illustrate some of the many possibilities for using these elements in attractive and unusual combinations.

Electric lamp shapes, symbolizing both new and old lamps, can be made in boxlike forms with the lamp shape cut into the face of the box and covered with a diffusing material to produce the luminous effect. This method lends itself to many different sizes.

Diamond shapes, either flat or three-dimensional, can be made in many sizes as required, using weatherproof lamp sockets held in place in welded wire frames. Sockets should be spaced on



LOW BRIGHTNESS DIAMOND

Diamond shapes can be formed of wood or metal and lighted with PAR lamps to form low brightness display elements in various sizes as required. Use of red, green and blue color lenses provide whitish light with color fringes, while clear daylight lamps enclosed in small boxes (above right) provide unique effect for distant viewing.

Displays

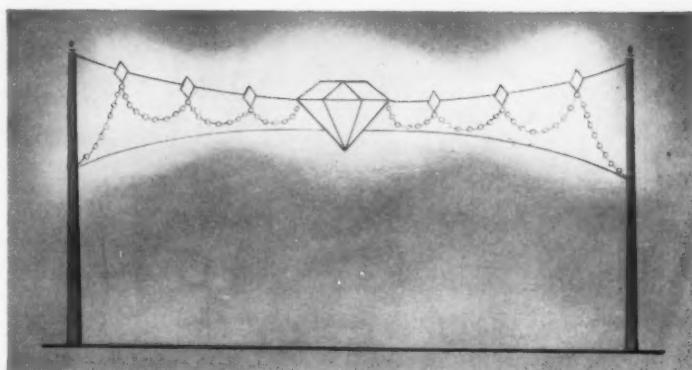
close centers, three to four inches apart, and clear-daylight lamps should be used to provide the characteristic blue-white effect of the diamond. Flasher buttons placed in randomly selected sockets will provide flash and sparkle simulating a diamond. Because exposed clear lamps are used in these elements, their brightness will be high.

Low brightness luminous diamond shapes can be made by using metal or wood housings with the sides formed into the diamond shape. Reflector lamps provide suitable lighting. By using red, green and blue cover glasses over the lamps, an effective whitish light will result, and the internal reflectors will flash spots of color suggestive of a diamond.

Display ideas shown here are generally for outdoor use. With some modification, however, many of these ideas are also applicable to indoor and show window display as well.

Variety and interest may be added to most of the display suggestions shown here by introducing brightness patterns and changing colors through the intelligent application of flashers and motor-operated dimmers.

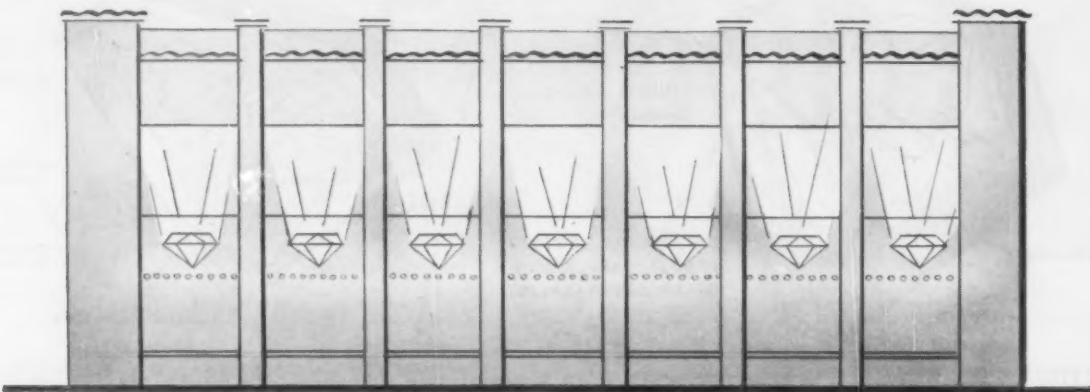
Street decorations provide a suitable medium for municipal or community celebration activities. Lamp and diamond shapes and the official emblem may very readily be combined in a variety of decorative display designs which are symbolic and appropriately keyed to the Jubilee.



TYPICAL STREET LIGHTING DISPLAYS

Symbolic elements such as emblem and luminous diamonds can be combined with bare lamp streamers or used on street lighting poles for decorative street displays.

(continued)



STRUCTURE of building facade often suggests display arrangement. Spaces between pilasters above are each treated

similarly. Row of lamps forms base of pattern and reflector lamps behind luminous diamond floodlight area above.

Luminous Displays for Building Facades

LECTRICAL contractors have an important stake in the success of local community Jubilee celebrations, and of the nation-wide activities. Thus they should cooperate with the local Jubilee committee, and participate in their community celebrations, to the fullest extent possible.

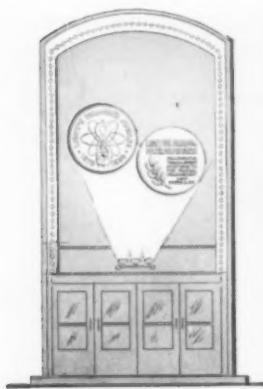
The principal objective of the Jubilee program is to give the American public a new concept of electrical progress. The extent to which this is achieved will have some bearing on the continued growth of the electrical industry. If an electrical contractor questions whether it is appropriate to identify his services—electrical wiring, for instance—with Light's Dia-

mond Jubilee celebrations, he might reflect that the incandescent lamp was the starting point for our electrical progress, and that the broad scope of the Jubilee is planned to include everything that goes to make up electrical living.

A contractor's participation in local Jubilee celebrations can be made more effective if his own sales promotion programs for 1954 are built around the Jubilee theme. In the broad subject of electrical progress, both past and future, there is something that every electrical contractor can use for this theme, whether his sales programs be on lighting, motors, wiring, electrical maintenance or repair. What-

ever he promotes as a part of his electrical construction business, that service contributes specifically to electrical progress and to a higher standard of living.

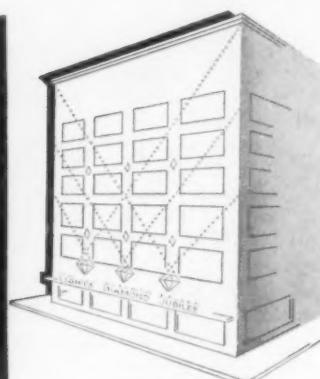
Throughout 1954, Light's Diamond Jubilee story is going to be told over and over, and brought to the consuming public in many ways. Electric power companies will tell it—on radio and TV, through store and window displays, and with large outdoor luminous displays. Electrical equipment manufacturers will tell it—through national advertising programs identified with the Jubilee and the opportunity it offers for great copy writing, through Jubilee identification in packaging and



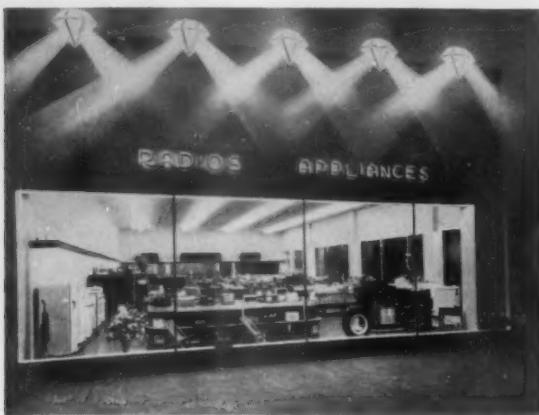
EMBLEM plaques are lighted by PAR lamps in housings, and area over door is outlined by lamps flush-mounted on wall.



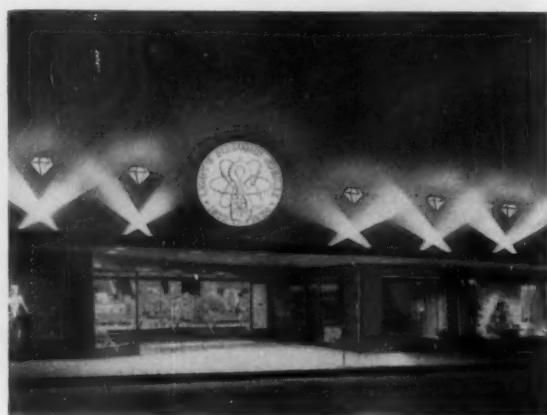
LETTERS along ridge of roof are often possible, and diamond elements may be appropriate in towers, or over entrances. Letters of faceted, polished metal are floodlighted from below with PAR reflector lamps.



FESTOONS of bare lamps form diamond shapes on building face, lead out from wire frame diamonds.



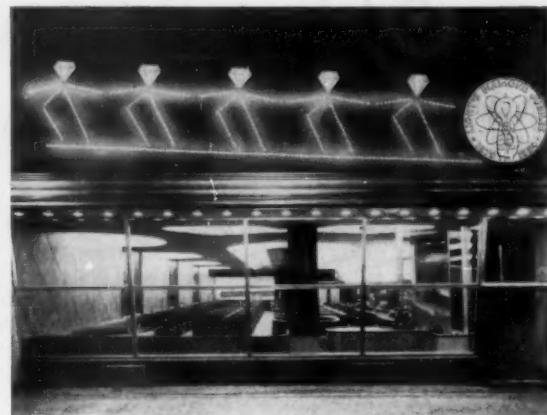
PAR LAMPS concealed behind luminous diamond forms may be used to provide interesting light patterns on building front. These are set out from building but supported from parapet.



FLOODLIGHTS installed on marquee close to building create distinctive patterns of light. Luminous emblem and diamonds may be applied for effective display.



SMALL LAMPS on close spacings create line of light effect, may be used to form appropriate patterns on large wall background. Medallion may be trans-illuminated, or opaque and lighted from border.



LAMPS assembled on wire frames of standard lengths provide a medium for many display patterns, may be combined with diamond elements. Three lengths are used in above example. Emblem is trans-illuminated.

labeling, through designation of new designs as Jubilee models, and in many other ways. National radio and TV programs will be devoted to it. And local merchants, alive to opportunities for timely tie-ins with popular programs, will devote window and store displays to it, and further identify their store and merchandise with the Jubilee in every way possible.

Store owners and office building managers are therefore excellent prospects for eye-catching and attractive luminous displays for their building fronts, such as shown here. These design suggestions, while practical and appropriate for effective displays, are provided to show how symbolic motifs can be used and to stimulate the design of appropriate displays.

In general, the most effective luminous displays will tie in with and become a part of the background or structural arrangement where they are used.

Usually the architectural treatment of the building will suggest an appropriate arrangement, and control the size and type of the various display elements.

Continuous rows of exposed lamps, either white or in color, may be used to form the base of many display patterns, or to help pull together and combine large luminous elements used as the key motif, or to create interesting patterns and display shapes. Randomly placed flasher buttons in these long lines of lamps add animation, and unusual multiple pattern

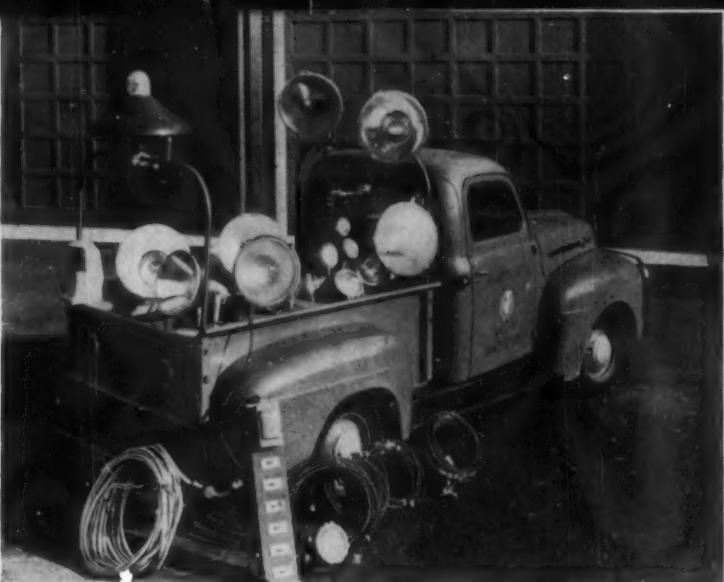
designs can be achieved with the use of motor-operated flashers and dimmers.

Lighting contractors will quickly recognize the opportunity presented by Jubilee activities to promote the sale of new lighting systems. It should be an easy matter for an electrical contractor to work out a program with his local Jubilee committee whereby each new lighting system installed in the community can be effectively associated with the Jubilee celebration.

Some of the illustrations shown here may suggest ideas for the permanent lighting of buildings. In designing an installation for the Jubilee, the contractor should give consideration to making a part or all of it permanent, and sell this idea to the owner.

LIGHT'S DIAMOND JUBILEE

(continued)



TYPICAL UNITS for floodlighting include lightweight and heavy-duty units for permanent installations. Atlantic City Electric Co. demonstrates floodlighting on buildings, monuments or landscaping by use of special floodlight truck.

Celebrate Jubilee With Floodlighting . . .

CELEBRATION of Light's Diamond Jubilee affords a timely opportunity to promote the revamping of old building floodlighting so that it can again be turned on. Many of these jobs will require additional floodlight units, and some will be prospects for the addition of color accessories, or for the complete substitution of new and modern equipment.

There are many modern new buildings which are excellent prospects for new floodlighting installations. Jubilee activities provide an excellent reason for promoting such installations during 1954. New floodlighting tech-

niques, and the complete new line of PAR lamps with varying light distribution patterns, weatherproof housings and lamp holders, and color accessories, make possible a variety of spectacular fixed and mobile color lighting effects at new low costs. Public buildings, monuments, churches, business establishments and other community landmarks are all prospects for temporary or permanent floodlighting. Such installations reflect a community's pride in its institutions, and are ideal projects for community Jubilee activities.

The completion of outstanding local lighting installations during this year

provides opportunities for Jubilee celebrations. Electrical contractors should bring all such installations to the attention of the chairman of the local Jubilee committee in charge of celebration activities. Even though it may not be possible to dedicate each job separately as part of the celebration activities, it may be possible to tie these jobs in with the program in some other way. One way would be to list each installation, and include the list in the celebration publicity, also to name these installations during talks before assembled groups, or on radio and TV programs dedicated to the Jubilee.

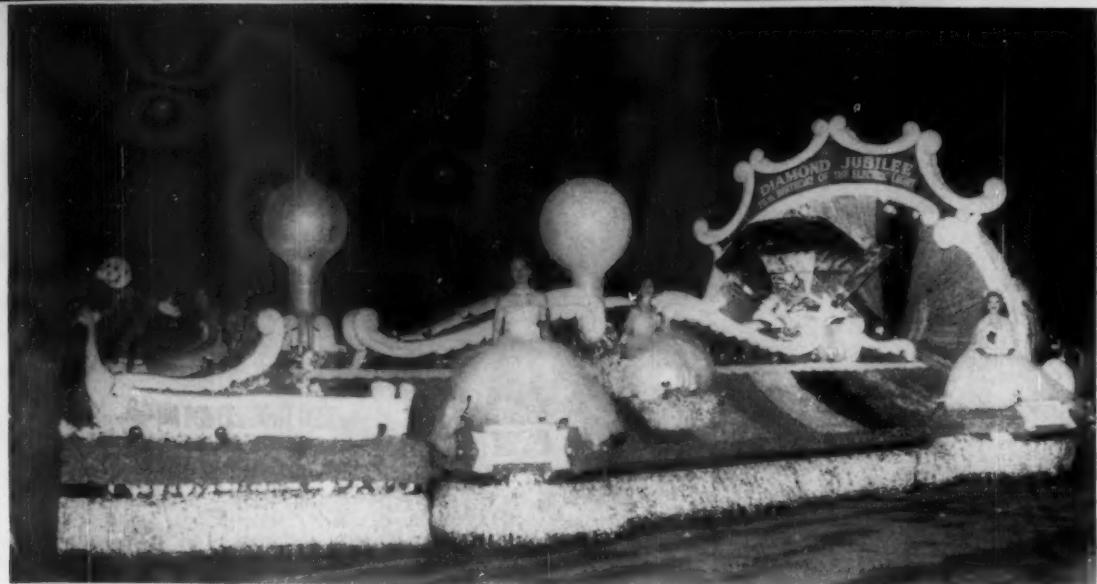


FLOODLIGHTING of buildings is effective way to join in celebration of Jubilee.



BUILDING at left is floodlighted from across street while building above is lighted by PAR lamps concealed on building's surface as shown by bird's-eye view in center.





FLOAT effectively pays tribute to 75th birthday of the electric light as part of Orange Bowl New Year's festivities in Miami, features old and new lamps and huge diamond.

... With Spectacular Displays

MOST Americans love a parade. Thus Diamond Jubilee parades should prove popular in many communities, and effective in promoting the Jubilee story if actively participated in by a large number of companies, stores and community organizations.

Such parades should be held at night and the various floats and displays should use light to the fullest extent to make them as spectacular as possible. Clever use of lighting can do much to glamorize the entire parade. All buildings on the parade route should be encouraged to light up with luminous exterior and show window

displays, and the route itself should be marked with spectacular and decorative street lighting displays.

Outdoor luminous displays depicting Jubilee themes, such as the one held on Biscayne Bay, Miami, on New Year's Day (below) can also be developed for mass viewing in parks, playgrounds, ponds and lakes, and similar areas according to the availability of such areas in the community.

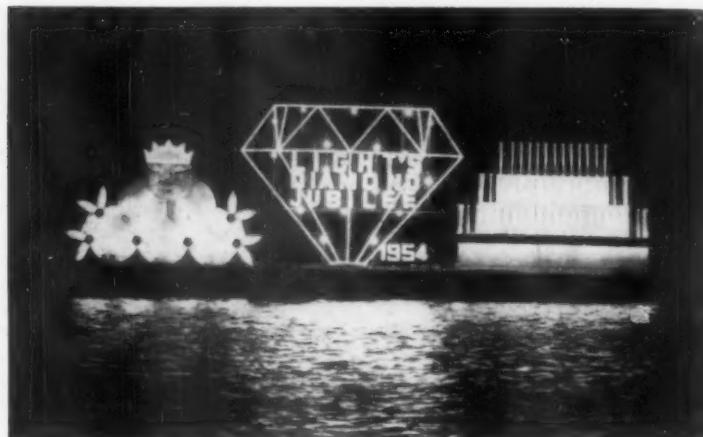
The Jubilee's theme is epitomized in a slogan and graphically represented by the emblem illustrated. Both can be used effectively throughout all phases of the Jubilee celebration. The slogan is "Light for Freedom—Power

for Progress", and is appropriate for incorporation in many displays either as luminous letters or in opaque form and floodlighted.

One face of the emblem shows Edison's first incandescent lamp bulb held against an atomic symbol. The reverse of the emblem gives the Jubilee slogan and a commemorative statement on Edison's achievement.

The slogan, the official emblem, and the various luminous elements of symbolic design shown may be used to key most displays to the Jubilee. Whenever possible, these elements should be combined with exhibits and displays having special local or historical interest. The luminous elements suggested have been designed so that they can all be made locally. Many contractors may want to consider making these available in quantities.

The Jubilee presents a wonderful opportunity for the electrical contractor to tell his story.



DISPLAY on Miami's Biscayne Bay at beginning of 1954 provided opportunity for King Orange to salute Light's Diamond Jubilee by lighting birthday cake as diamond form flashes on.

Editorial material in this article was prepared by EC&M's Eastern Editor, Berlon C. Cooper with the cooperation of General Electric's C. M. Cutler, lighting consultant to three World's Fairs, who developed the pictorial ideas. Reprints are available at 15 cents per copy.



PARADE TO THE POST is illuminated by even 20-footcandle coverage provided by banks of 32 floodlights mounted atop 80-foot poles. Each pole has a separate 4160-120/240-volt transformer mounted 30 feet from the base, and a panel box containing separate fused circuits for each lighting unit.



GRANDSTAND is generally illuminated by 500- and 200-watt incandescent units, with those located above aisles and exits served by an automatically-switched auxiliary generator in the event of utility power interruption. Searchlights on top of the stands and a bank of pole-mounted floodlights on the infield side of the finish line combine to deliver 350 footcandles at that point for critical judging and photography purposes.

Upstate New York Vernon Downs Claims . . .

Best Lighted Harness Track

Two Central New York electrical contracting firms—Bradley & Williams of Syracuse and Langdon & Hughes of Utica—worked together to solve some unusual and difficult installation problems encountered during the construction of an upstate harness race track. The installation provides up to 350 footcandles at the finish line.

ONE of the nation's best lighted night harness race tracks was christened last summer at Vernon Downs, N. Y., after two central New York electrical contracting firms had combined their engineering know-how, construction equipment and labor potential to win a photo-finish race against a tough opening day deadline, some unusual construction problems, heavy rains and an ocean of mud. In so doing, Bradley & Williams, power-line contractors of Syracuse, installed all pole and parking area lighting and, in cooperation with the Niagara-Mohawk Corporation, designed and erected a substation to provide an initial 13,300-volt service for this new installation.

Simultaneously, Langdon & Hughes Construction Co. of Utica installed three secondary substations, underground circuits for floodlight towers, flood- and searchlights for the finish line, an extensive public address system, plus all indoor electrical equipment in the clubhouse, grandstand, ad-

ministration building, garage and secretary headquarters. Both contractors followed a lighting plan prepared by Crouse-Hinds, who supplied all floodlighting equipment and aimed the units after installation. Overall design and layout of the complete plant was by Albany architect Marcus T. Reynolds.

Throughout the entire construction period, time was a critical factor for, only five months before the inauguration of the first racing meeting, Vernon Downs was but a plot of pasture land, and recurrent rainstorms during the early weeks of the contract imposed a severe handicap on all types of outdoor work. Yet, by adopting several time- and labor-saving approaches, both contractors satisfactorily met their tight deadlines.

For example, since foundations for floodlight poles were established prior to the grading of the track site, and since existing elevations therefore had to be raised or lowered by as much as 30 feet before concrete forms could

be constructed, Bradley and Williams used a bulldozer to fill in low spots and a 42-inch-diameter portable earth auger for excavation purposes. Once all pole holes were raised or lowered to final grade level, forms were built and concrete pads at least 8-feet thick in all cases were poured. Concrete forms were held level by means of crossarms secured to the wooden templates; the crossarms, in turn, being held firmly by anchor rods which ran through and were bolted to them. Concrete was then poured in 6-foot layers, with a 3-week setting period between successive pours. At each foundation, the upper concrete layer contains a large-radius elbow to permit the direct-burial power cables to sweep up from their underground path to the various pole service points.

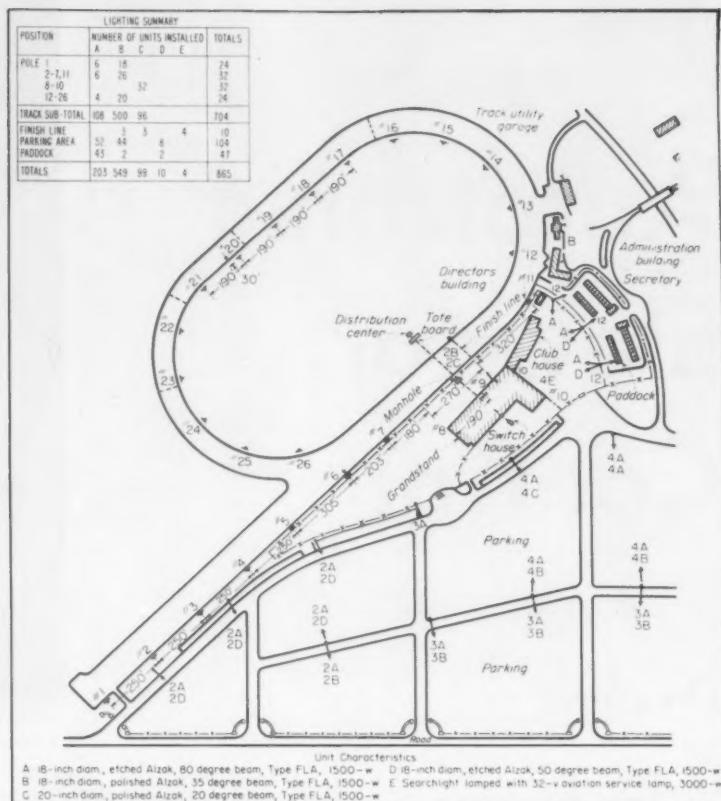
After pouring and setting had taken place, 80-foot steel Monotube poles were lifted into place by a truck-mounted crane, then were plumbed and bolted to base pads. After erection of towers, step-down transformers were



POLE MOUNTED FLOODLIGHTS are initially aimed with quadrants. For relamping, or cleaning, head may be swung away from reflector or entire unit may be tipped upward.

located 30 feet up each pole to reduce line voltage to 120/240. Both primary wiring (from base elbow to transformer elevation) and secondary wiring (from transformer up to the floodlight panel box) are located inside the supporting pole. Each pole transformer is protected by an expulsion-type fuse, and individual fuses are contained in each floodlight circuit radiating from the panel box.

To electrically serve the racing plant, utility power is initially stepped down to 13,300-volt, 3-phase, 3-wire service at a substation located three miles from the track, and is then carried overhead by pole line to a secondary 13,000/4160-volt sub located adjacent to the grandstand. This power is further reduced to a 120/208-volt level to service lighting and motors located in the stands and various buildings around the grounds and, as previously noted, it is reduced to a 120/240-volt level via tower units to supply track and parking area floodlights.



A TOTAL OF 865 FLOODLIGHTS, most of them operated at 10 percent above rated voltage to produce a third more lumen output, are installed around the track, chute, paddock and parking lots. Lights were initially aimed in accordance with the results of plotted distribution patterns, while final adjustments were made after installation, using actual lightmeter readings for checking purposes.

Routing of this floodlight power begins at the 13,000/4160-volt sub; travels to a master distribution point in the basement of the secretary's building, being carried underground via two 400-foot long direct-burial 350-MCM shielded feeders; thence, again underground via 11 separate circuits to the various lighting towers. In this installation, main feeders incorporate fused air-breakers equipped with special arc-snuffing tubes, while the 11 branch circuits leading to floodlight transformers are carried through separate 3-pole, 5000-volt manual oil pot switches. Each branch circuit serves six banks of pole-mounted lights; adjacent poles being connected to different circuits, and circuits being balanced between the three phases. This arrangement insures partial illumination over the entire track in the event of a partial power failure.

In laying underground branch circuits for floodlight units, Langdon and Hughes also faced the problem of establishing their cable datum plane

before general grading and leveling of the track was completed. Therefore, in order to make sure that their cable would not be inadvertently disturbed at a later date by subsequent earthwork they adopted a trench depth considerably greater than would otherwise have been necessary. For this operation, nearly 90,000 feet of direct-burial cable was used, cables being laid on a sand fill at the bottom of trenches prior to backfilling. Completing the track floodlighting installation, the Utica firm drove ground rods at each tower location, then connected all poles to this series of rods by means of a common grounding loop. In this manner it will be possible to maintain a continuous positive ground at all poles, even though (due to fill and drainage characteristics) some of the rods may prove ineffective during prolonged dry spells.

Since this huge racing establishment covers over 340 acres and since foot-candle levels range from 20 (IES

(Continued on page 128)

Autotronic Elevator Control

... A Modernization

Dividend

Completely automatic electronic operation selects the appropriate dispatching program as heavy traffic loads change; obtains maximum coordination from each bank of elevators, speeds service, reduces operating costs and modernizes old buildings competing for today's rental market.

AUTOTRONIC elevator operation—an entirely new concept of fully automatic electronic control—is establishing new efficiency standards in large office buildings, hotels, hospitals and department stores faced with constant, heavy elevator traffic. These new systems practically think for themselves and can operate effectively without a starter in the lobby or without attendants on individual cars. They readily adjust their patterns of operation to cope with changing traffic requirements throughout the day. They coordinate the operation of individual cars in order to obtain maximum group effectiveness. They promptly readjust themselves whenever momentary surges of traffic disrupt normal requirements. And they completely eliminate those human elements of fatigue and delayed mental reaction that can—and frequently do—result in slow starts or stops, inaccurate interpretation of signals, the passing by of passengers waiting on upper floors,

faulty leveling of cars, or retarded opening or closing of doors.

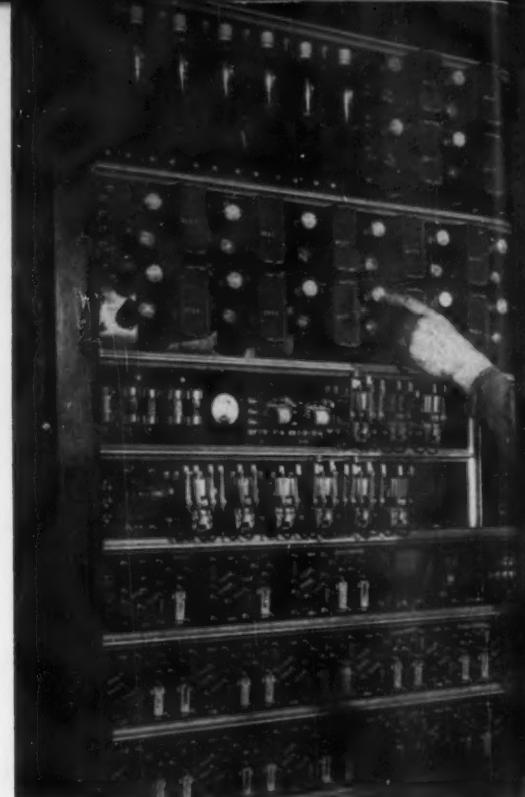
As a result of installing autotronic control, each elevator can cut a few seconds off each operation and complete a round trip in less time, make more trips per hour, and thereby contribute to the efficiency of the entire group—frequently making it possible for three autotronic elevators to do the work formerly accomplished by four manually-controlled cars. Without increasing the speed of travel through shaftways, service is speeded due to faster acceleration, deceleration, leveling and door operation. And, moreover, individual passengers are given smoother rides and quicker service because fallible humans have been replaced by untiring, instant-responding electronic devices that automatically carry out all details related to supervision and operation.

Essentially this new autotronic control relieves the starter of having to constantly analyze his traffic demands

and his car spacings. Manual adjustments are taken out of his hands, and car dispatching, car spacings and passenger waiting times are automatically controlled.

Physically, these systems include electronic signal control elevators, standard controller panels, an electronic panel and an autotronic dispatching panel. On this last panel—the "brain" of the system—electron tubes set up electronic circuits that actuate electro-magnetic switches and relays on individual elevator panels, resulting in perfect coordination of the elevator group as a whole.

This automatic adjustment can set up and put into operation any one of six different traffic patterns: balanced up-down, heavier-down, heavier-up, up-peak, down-peak, and intermittent. Thus the electronic brain provides automatically for efficient handling of the morning rush when "up" traffic is heaviest, it restores a balanced program between peaks, sets the system again



SUPERVISORY UNIT keeps elevators in step with flow of traffic, with electric "brain" selecting appropriate



dispatching programs as traffic patterns change throughout the day. Fig. 1.

to handle the increased lunch period volume, both down and up, then switches to the down-peak program at closing time in the afternoon. In addition, the intermittent program automatically goes into effect during evening hours and on holidays when traffic is light and there is no need to keep all elevators operating.

As indicated by Fig. 5 an indicator and control panel for a 10-story multi-purpose office building served by four autotronic operatorless elevators would include an indicator panel at the top, controls for cars-to-lobby intercommunication in a center section and (at the bottom) switches for cutting cars out of service, plus a manual program selector switch with a position for each one of the six autotronic traffic control programs. This switch would normally be set for automatic operation, permitting the traffic analyzer and automatic program selector to select and put into effect the correct program required by the existing traffic pattern. The indicator panel (at the top) contains bullseye lights showing the position of each car in service, the position of each waiting hall call, the directions in which the cars are running, the cars selected for loading at the terminal, and the setting and resetting of dispatch signals.

For this same 10-story 4-car building, an operating console such as the



PASSENGER presses numbered button on car control panel located adjacent to entrance. Automatic controls close doors, start car. Fig. 2.

one shown in Fig. 5 would contain 70 electronic touch buttons, so arranged that anyone could operate any or all of the elevators in the building from one central position.

With this system, elevators operate and respond to calls without human supervision or attendance and, depending on what kind of traffic exists at the time, the automatic traffic analyzer decides what dispatching program is required, and the automatic program selector switches the system to that program.

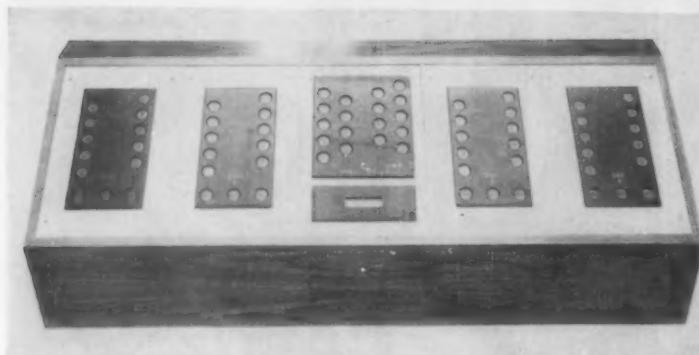
As to operating procedures, people stepping into an autotronic elevator do not call out their floors to an attendant, but simply press a numbered button on a control panel—or on one of two panels positioned on either side of the entrance for greater convenience. After a given waiting interval or a predetermined weight has been reached, the doors close automatically, the car starts on its way and is dispatched in accordance with the traffic pattern required at the time.

If, during a morning up-rush, passengers fill the elevator ahead of the scheduled interval, an automatic "load weigher" starts the car as soon as it is comfortably filled. If the car is too full to accommodate waiting passengers on upper floors, service is speeded by bypassing these calls temporarily, stopping only to discharge.

During these rush periods, passenger waiting times are automatically measured by condensers and, when the voltage of a single condenser builds up to a predetermined point, an electrical impulse is sent to the dispatching panel and the operation of one elevator is altered to take care of that local traffic situation. Following this same procedure, when passenger waiting times on several lower floors reach a certain level without car pick-up, some of the cars in service are automatically dispatched to this lower zone in the shaft, and this arrangement continues until calls from the lower floors drop off. The system then automatically readjusts itself for normal operation.

With this new method of operation, it is apparent that service is speeded and overall capacities of elevator groups are increased. Buildings are emptied more quickly during rush hours and the human factor of dispatching is practically eliminated. Scheduling is coordinated with exact traffic demands, passengers are not forgotten, and special service is directed to anyone waiting for a predetermined interval.

This new concept of vertical transportation is supervising the operation of hundreds of elevators across the country, and public acceptance is growing so rapidly that over 80% of all new office building installations being



TOUCH BUTTON CONSOLE permits all cars to be operated from one central location by engineer who presses electronic signals, thereby activating any car and moving it to desired floor level. Fig. 3.

made by the Otis Elevator Company are now incorporating provisions for supervisorless-operatorless programming. This broad acceptance emphasizes the system's successful adaptability for buildings of many types having the common problem of heavy elevator traffic. It also indicates that it is now practicable to operate groups of high-speed intensive-service office building elevators safely and efficiently without individual attendants, with electronic devices being used as a perfect, patient, tireless starter having a dependable electronic brain with miraculous capacities for accumulating, sorting and storing pertinent traffic information and applying it in a manner to secure the best results under all circumstances.

Historically, autotronic group supervision was first introduced by Otis in 1948, but at that time the six dispatching programs were under the control of a human starter who mentally determined the requirements and then physically made the selection of traffic pattern. Since that time, however, the application of an electronic analyzer has come into being, so that now selection of pattern is automatic and changeover from one program to another constantly matches elevator performance with existing traffic requirements.

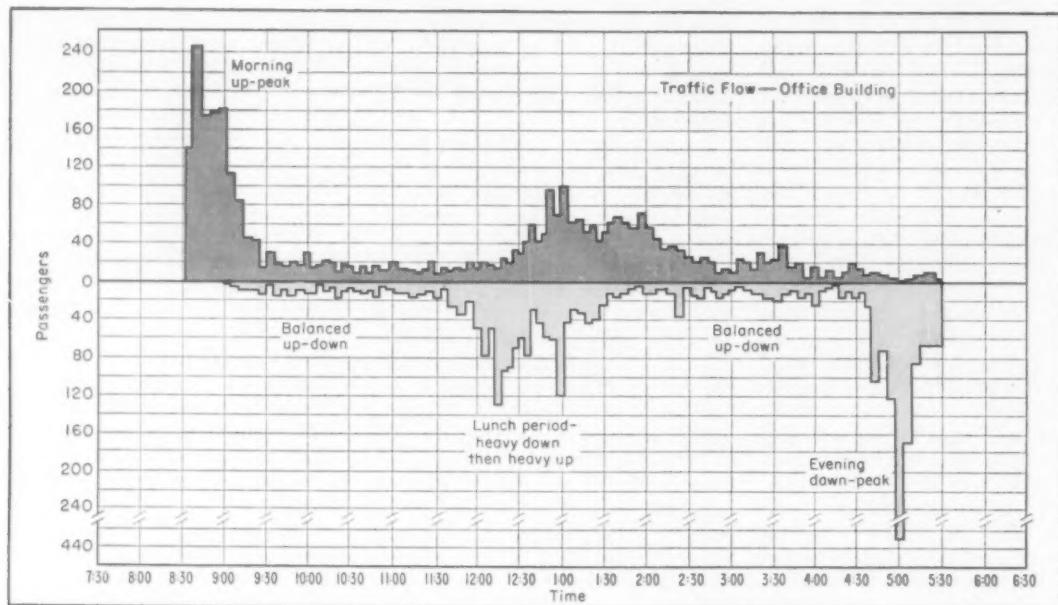
While this discussion has so far presented advantages to be obtained by installing autotronic elevators in new buildings, property owners of old buildings also are interested in this

automatic electronic system as a modernization medium. Their reasoning is practical; for constructing an entirely new building today would cost $2\frac{1}{2}$ times more than it would have in the '20s, and five times more than it would have prior to World War I. Therefore, if an old, existing building is well designed and soundly constructed, it can be modernized—even extensively—for only a fraction of the cost of new construction.

Since basic elevator machinery has changed little in recent decades, modernization of elevators can be reasonably obtained by replacing outmoded controls, installing "floating" cabs mounted on rubber to cushion passengers from noise and vibration, replacing obsolete open-grille enclosures with modern hollow-metal entrances, installing rubber-tired roller guides and modernizing the lighting and ventilation.

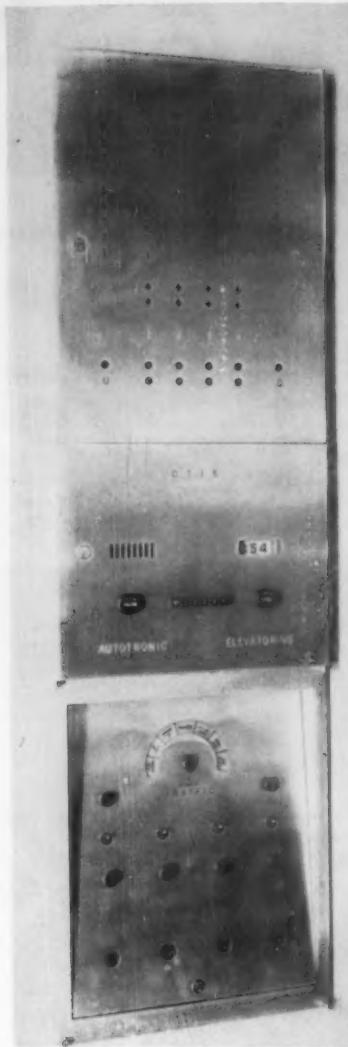
All of these recommendations are relatively inexpensive, yet they make it possible for an old building to "dress up" to the point where it can compete with newer structures in attracting desirable tenants and justifying higher rentals. By so doing, property owners are finding a way to lessen the squeeze between fixed or decreasing incomes and rising operating costs.

Installing operatorless elevators goes a long way toward reducing these operating costs, for a survey of 61 cities in the United States shows that the cost of providing elevator-attendant service averages \$4424 per car per



SIX BASIC TRAFFIC PATTERNS are prevalent in office buildings; the balanced, heavy and peak up-down condi-

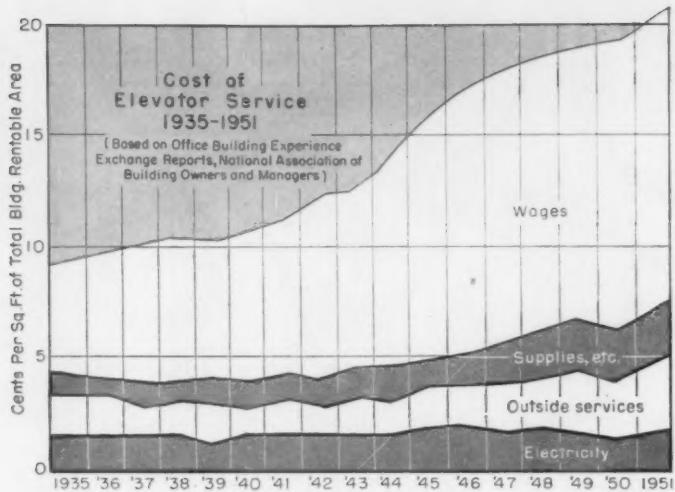
tions recorded during the normal working day, plus a light, intermittent program. Fig. 4.



CONTROL PANEL can be set for automatic operation, with dial lights indicating which of six patterns is in effect; such as intermittent, down-or-up-heavy, down-or-up-peaks, etc. Fig. 5.

year; ranging from a low of \$3064 in Oklahoma City to a high of \$7500 in Chicago. This includes wages for the attendant, his relief and replacement, social security and other "welfare" expenses, the cost of uniforms, hiring and training, administration and supervision, locker space and insurance. Therefore, doing away entirely with the need for elevator attendants, by installing fully automatic electronic controls, can save enough in operating costs to pay for the modernization within a few years at most.

Another advantage to be realized through elevator modernization is the release of electrical feeders for other purposes. For example, a Cleveland



COST OF ELEVATOR SERVICE has more than doubled in the past two decades, due primarily to rising wage scale for attendants. This cost can be slashed by installing autotronic controls, thereby obtaining faster, smoother service while eliminating all attendants. Fig. 6.

Cost of Elevator Attendant Service

(Per car per year)

	Wages	Welfare	Uniforms	Lockers	Administration	Total Cost
Chicago, Ill.	6107	487	131	77	698	\$7500
New York, N. Y.	5341	597	174	90	965	7167
Washington, D. C.	4528	464	143	111	586	5832
San Francisco, Cal.	4915	456	60	58	62	5551
Pittsburgh, Pa.	4165	264	134	58	893	5514
Seattle, Wash.	4495	339	120	95	421	5470
U. S. Average	3574	250	102	81	417	4424
Memphis, Tenn.	2985	231	96	54	198	3564
St. Louis, Mo.	2787	105	115	71	301	3379
Atlanta, Ga.	2626	85	66	106	396	3279
Dallas, Tex.	2498	105	202	120	304	3229
Omaha, Neb.	2705	143	87	121	160	3216
Oklahoma City, Okla.	2390	147	127	96	304	3064

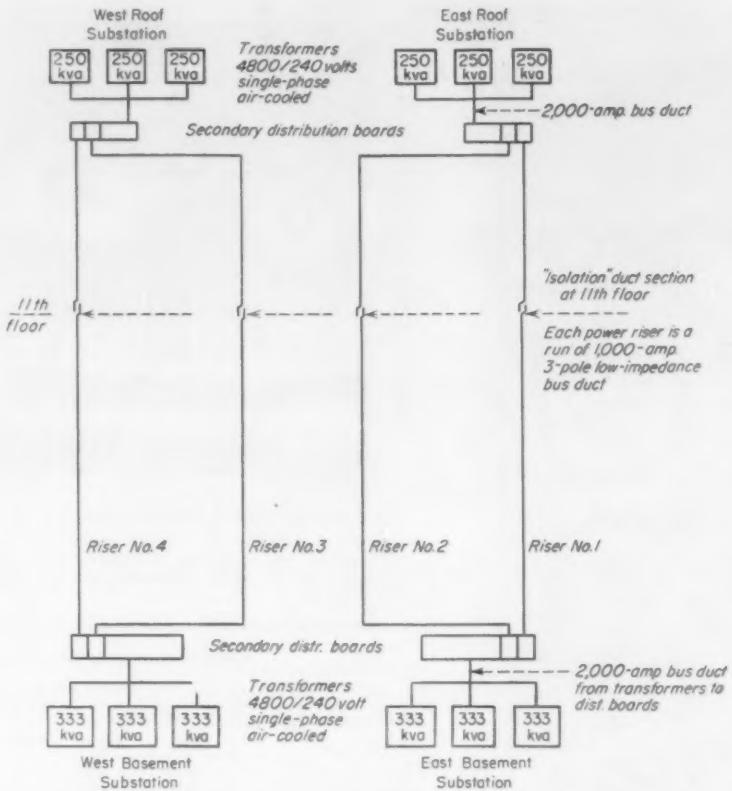
ATTENDANT SERVICE varies widely across the country, since records of all buildings are not kept uniformly. In this table, wages include relief and replacement, Welfare includes social security taxes and benefits, Uniforms include replacement and cleaning, Lockers include all conveniences, and Administration includes hiring, training. Fig. 7.

building recently installed autotronic controls, improved service materially and, in addition, was able to shut down two of its ten elevators; making it then possible to re-use the released electrical capacity for additional lighting—a very desirable and greatly needed improvement which would not have been possible with the previously overloaded distribution system. Still other testimonies as to the wisdom of modernization come from San Francisco (where a 50-year-old landmark obtained economies amounting to 20% of the building's payroll by installing up-to-the-minute elevator equipment) and from Nashville (where service in one of the busiest office buildings was im-

proved 30% when elevators were altered so as to permit operatorless-starterless service).

All of these illustrations indicate that electric and electronic equipment can control elevators far more efficiently than human minds and muscles—and can do so consistently over long periods without tiring. Also, by automatically stopping at all floors where passengers have pressed buttons, synchronizing the opening of doors with the leveling of cars so that both jobs are completed simultaneously, accelerating faster and recording signals accurately, they can render a definite contribution toward the alleviation of traffic jams in large buildings.

*Electrical
Modernization*



RISER DIAGRAM of new secondary power system for room air conditioning units. Each bus duct riser serves one-fourth of building. "Isolation" points at 11th floor permit secondary tie between roof and basement substations.

Bus Duct Risers Provide More Power for Summer Comfort

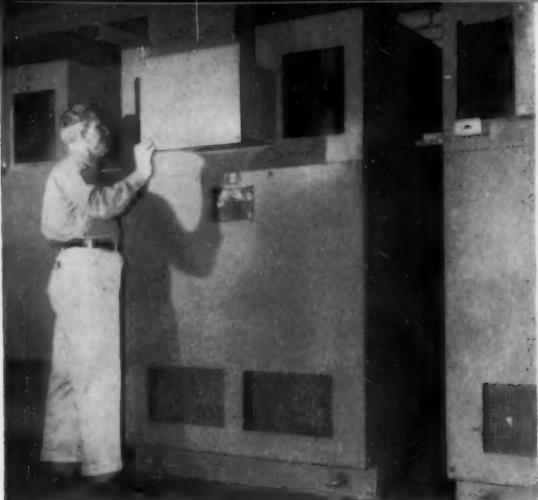
... at General Motors Office Building
in Detroit. Rewiring solves air
conditioning load problem. Color-
coded circuits pulled in existing office
lighting branch conduits.

PYRAMIDING air conditioning loads forced the first major alteration in electrical distribution at the 34-year old General Motors Building in Detroit. Complete redesign of the power system climaxed a 4-year struggle to meet the ampere demands of room air conditioners in the 15-story structure with its 2,200 offices and numerous display areas. Additional transformer capacity and new bus duct risers solved the problem of critical system overloads.

Until individual air conditioning units began to appear in various offices, the existing 1,500 kva of power capacity was quite adequate. This was divided into two basement substations,



MAIN PRIMARY SWITCHROOM in annex building. Power breakers on right control primary circuits to basement and roof substations.



BASEMENT TRANSFORMER ROOM contains new bank of three 333-kva, 4,800/240-volt, single-phase, air-cooled units. Air conditioning load takes 70% of this capacity.

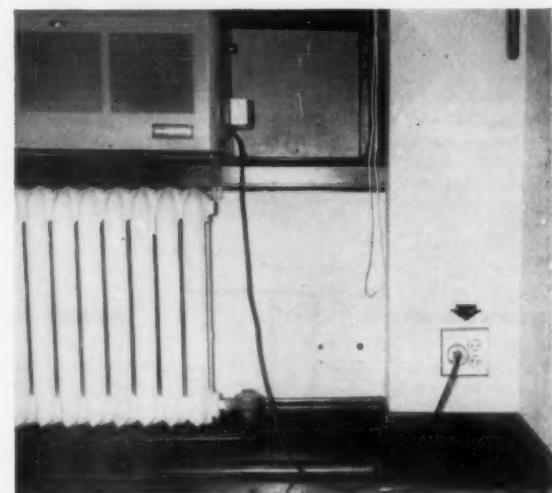


ROOF SUBSTATION, one of two added, contains bank of three 250-kva, 4,800/240-volt, single-phase, air-cooled transformers for air conditioning power load. Switchgear at right feeds two 1,000-ampere bus duct feeders down to 10th floor. Equipment at left is for new lighting distribution system.

each containing three 250-kva, 4,800/240-volt, single-phase transformers. While general building power requirements remained fairly static, the total power load rose steadily as the number of room air conditioners (average 1-ton capacity, 8.5 amperes at 230-volts) increased to a total of 1,659 in 1953. The decision to rewire came when it was apparent that even forced-air (fan) cooling of power transformers during summer months would do little to alleviate a possible system breakdown.

New System Doubles Capacity

The new power system provides almost 3,500-kva of power capacity

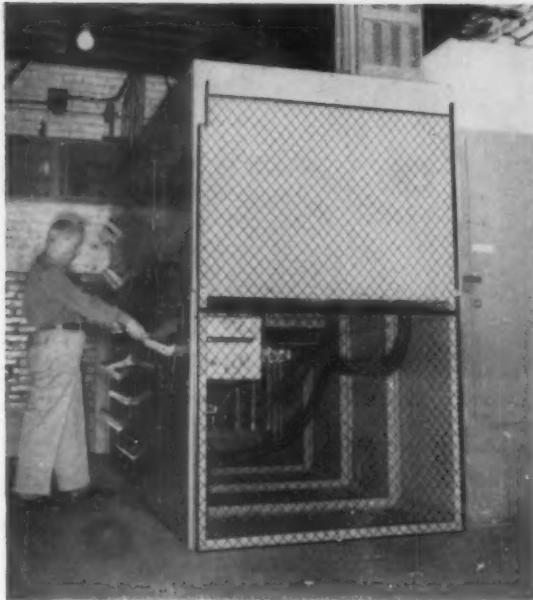


EXISTING WALL OUTLET in office becomes combination unit (arrow) by simple addition of surface-type box containing air conditioner receptacle (20-amp., 250-volt 3-pole, grounded) and standard duplex unit. Original concealed conduit is raceway for both power and lighting conductors.

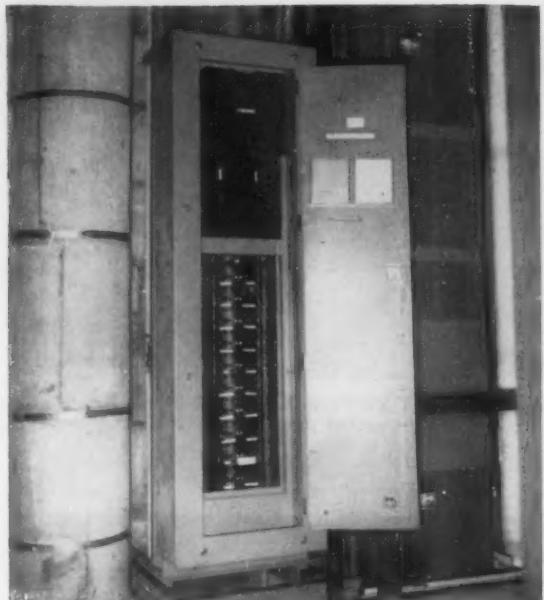
POWER SYSTEM CAPACITY

Substation	Substation Transformers	Power Allocation Capacity	Air Conditioning	Gen. Power
OLD SYSTEM				
East Basement	3—250	750-kva		
West Basement	3—250	750-kva		
Total Power		1,500-kva		
NEW SYSTEM				
East Basement	3—333	999-kva	70 percent	30 percent
East Roof	3—250	750-kva	100 percent	
West Basement	3—333	999-kva	70 percent	30 percent
West Roof	3—250	750-kva	100 percent	
Total Power		3,498-kva		

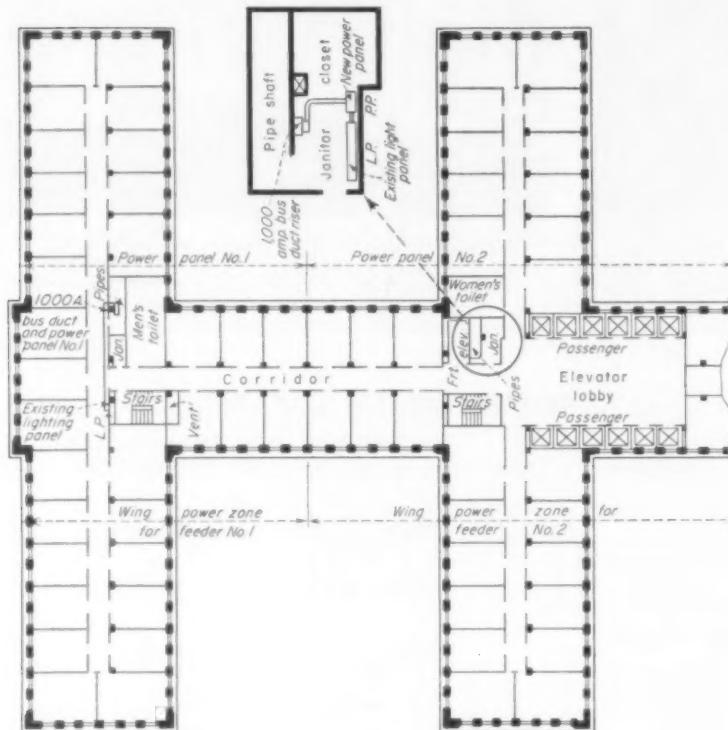
Note: Where 115-volt air conditioning units are encountered, 1,000-watt transformers are installed to step down voltage at the outlet.



NEW SECONDARY SWITCHBOARD fed by bank of basement transformers controls power circuits serving 10 floors of one-half of the building. Two 1,000-ampere bus duct risers in foreground. Continue to 11th floor, where provision is made for tying into roof substations.



POWER PANEL in pipe shaft is mounted in front of bus duct riser to save space; fed by tap-off box above. Circuits from bottom switches go through existing lighting panel across corridor, then to office outlets. Large bus duct at right is new lighting feeder.



TYPICAL FLOOR PLAN of one-half of building shows central location of bus risers in pipe shaft or janitor's closet. Power branch circuits are fed through existing lighting panels and conduits to offices. Each feeder serves one wing and one-half of connecting corridor.

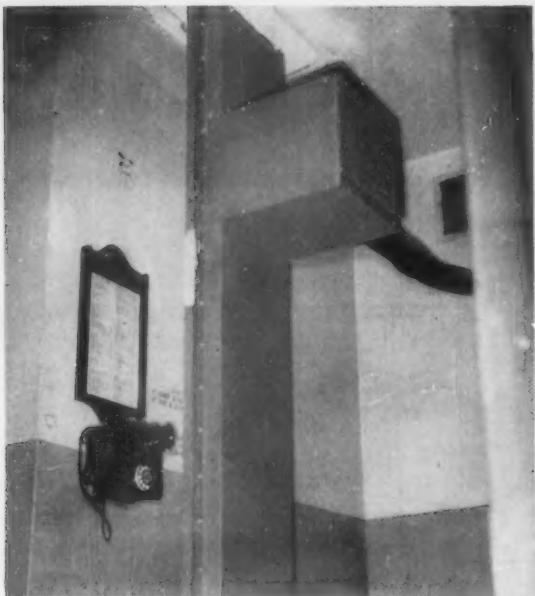
compared to the original 1,500 kva. About 82% of this new 3-phase power capacity serves air conditioning load.

Existing basement substations (east and west) were retained in the new layout but larger transformers were installed. Each substation now has three 333-kva, 4,800/240-volt, single-phase, air-cooled transformers to serve power requirements of the basement through the tenth floors. About 70% of this capacity goes for office and display area air conditioning.

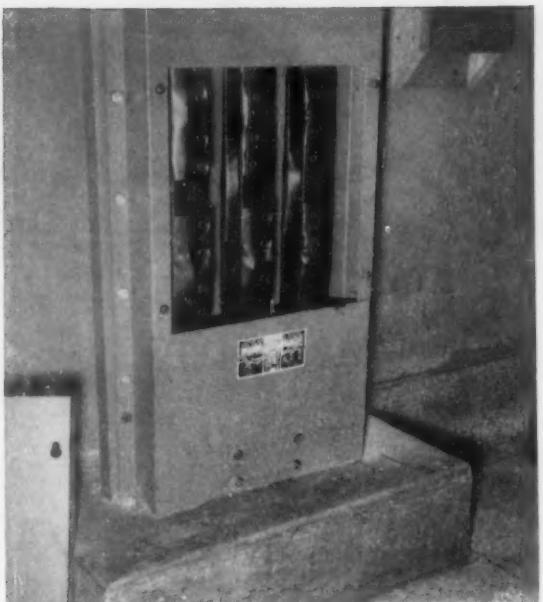
Two new roof substations (east and west) were added to serve the eleventh through fifteenth floors. Each contains three 250-kva, 4,800/240-volt, single-phase, air-cooled transformers with practically 100% capacity allotted to air conditioning requirements.

Two parallel, 4,800-volt feeders provide primary service to the roof subs. Each consists of a 3-conductor, 500-MCM, VCL cable in a 3½-inch conduit installed in an elevator shaft. Cables are continuous from the main building manhole (which connects to primary switchroom in an annex building) to the roof substation switchgear. Cable supports are installed at three-floor intervals.

Building layout (four massive wings connected by a central corridor) lent itself to easy division for feeder load



MORE SPACE for 1,000-ampere power bus duct riser is provided in janitor closets in center wings of building. Duct tap-off feeds new power panel mounted next to existing lighting panel in room. On floors where space was lacking in closets, power panels were located in adjacent pipe shaft.



ISOLATION SECTION in each feeder at 11th floor permits emergency secondary tie between roof and basement substations. Note sturdy angle-iron "runners" behind duct and concrete curb to prevent mechanical and moisture damage in janitor closet locations.

allocation. Each wing plus one-half of the adjacent connecting corridor comprises a load zone for a secondary feeder which rises from basement to roof.

Four 1,000 ampere, 3-pole, 240-volt, low impedance bus duct risers serve power to the entire building and are located near the center of each wing. Two risers originate at the east basement substation and terminate at the east roof sub. Two similar feeders start at the west basement sub and end at the west roof substation.

Although all risers are continuous, "isolation" sections at the eleventh floor level divide the load between the basement and roof transformers. Should a failure occur at either substation, the riser bus bars can be tied together and all floors will continue to receive power.

Riser bus duct and power distribution panels are concealed in a tier of janitor's closets or pipe shafts (which ever provided more space) running the full height of each building wing. The continuous vertical ducts are mounted to sturdy 1½-inch angle-iron "runners" installed from basement to roof. Additional flange brackets support runners and duct at each floor. Where risers pass through janitor closet terrazzo floors, a substantial con-

crete curb protects the duct from mechanical damage and moisture.

Cable tap-offs at each floor connect the feeder duct with adjacent power panels. Typical distribution panels consist of a main fused disconnect, a few 3-pole fused disconnects for general power circuits, and a series of 30-ampere two-pole switches with fuses for air conditioning circuits. Normally, one branch circuit feeds two room conditioners.

Use Lighting Branch Conduits

Biggest branch circuit problem was that of reaching office outlets with a minimum of cutting and patching. Careful study of the lighting distribution system revealed that existing conduits could be used to advantage for both power and lighting conductors. Cutting, patching, and surface raceways in individual offices were unnecessary.

Each ½-inch "home run" conduit served two offices and contained two No. 12 duplex cables. These were pulled out and replaced with four No. 12 single-conductor type TW wires (for lighting) and four No. 10 type TW conductors (for power). Air conditioning circuits originate at the power panels, pass through the lighting panel gutters and home run conduits, then

continue in lighting branch raceways to a wall outlet nearest the room conditioner. Red and green color-coded conductors identify the air conditioning power circuits in the lighting conduits.

Existing single-gang, flush type, duplex receptacles were easily converted to combination power and lighting outlets. A two-gang, metal, surface-type receptacle box, mounted over the existing wall outlet, contains a single, 20-amp, 250-volt, 3-wire, grounded, twist-type receptacle (for the air conditioner) and the original 110-volt duplex receptacle (for portable equipment). When painted to match the wall color, the new outlet makes a neat, inconspicuous installation.

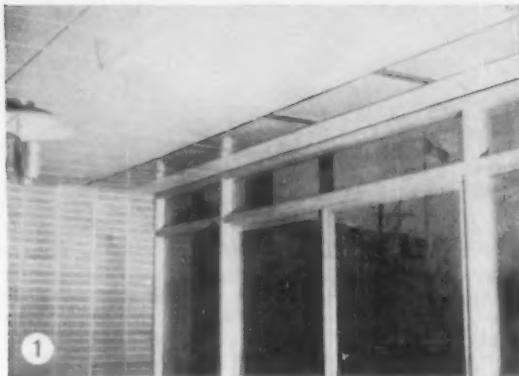
All individual room air conditioning units are now on the power system. In a few isolated cases where 115-volt units were encountered, 1,000-watt transformers were added to step down the power voltage at the outlet. In general, units of 1-ton capacity or less are on single-phase circuits, larger units (primarily in display areas) are connected to three-phase circuits.

Tenants and employees in the General Motors Building can now face the summer months confident that the air conditioning units will operate.

A Case Study of

Complete Electric Radiant Heating

... in St. Simeons Parish Rectory at Bellwood, Illinois. Automatically controlled ceiling glass panel system provides comfortable curtain of warmth.



GLASS CEILING PANELS in L-shaped pattern are mounted flush over full length window and door in living room. Similar arrangement is used on opposite side of room over double-glazed windows.



DINING ROOM HAS 500-watt heating panels to provide curtain of radiant heat in front of window area. One thermostat controls this group plus one 750-watt baseboard unit.

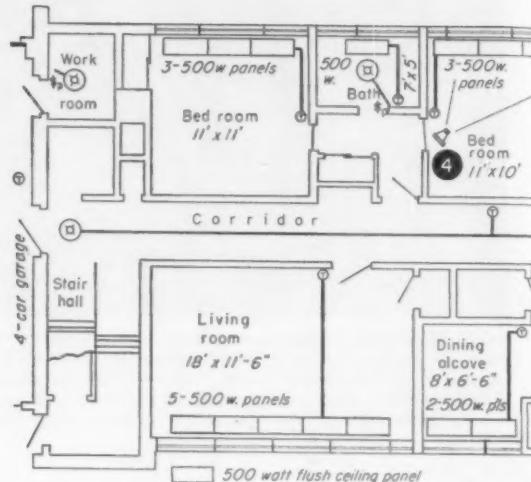
COMPLETE electric radiant heating is an outstanding feature of the new two-story, steel frame, brick and wood-panel rectory designed for St. Simeons Parish in Bellwood, Illinois, by Chicago architect Nairne W. Fisher & Associates. Of the 105-kilowatt total connected load in the all-electric residence approximately 75 kilowatts are allocated to space heating, 21 for kitchen equipment, 9 for

lighting and miscellaneous power loads.

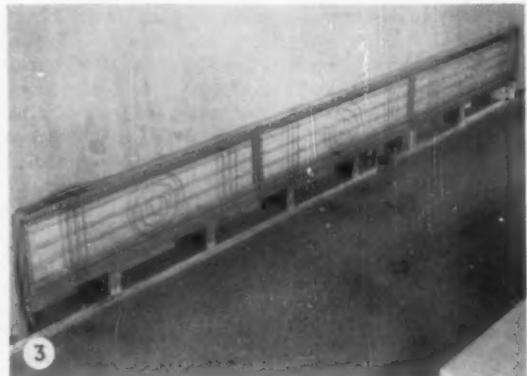
The entire electrical system, installed by Allied Electric Company, Maywood, Ill., is fed by a 600-ampere, 3-phase, 4-wire, 120/208-volt service. Entrance conductors consist of eight 300MCM, single-conductor cables in two 3-inch conduits. Circuit fuses in the service equipment cabinet protect feeders to distribution panels on each floor, basement, kitchen and the heat-

ing load. A set of 400-ampere fuses serves the 300MCM feeder (2½-in. conduit) to the 20-circuit, circuit-breaker panel at the heating control center on the opposite basement wall.

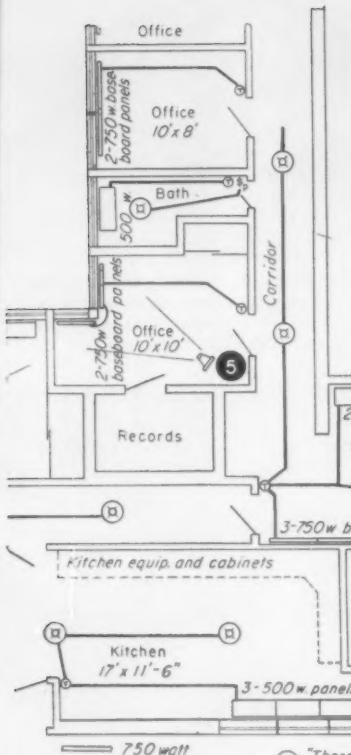
Glass radiant heating panels are used throughout the well-insulated building. Wattage, type and number depend upon the room or area being heated. In living areas, groups of two to five 500-watt flush ceiling panels, in tan-



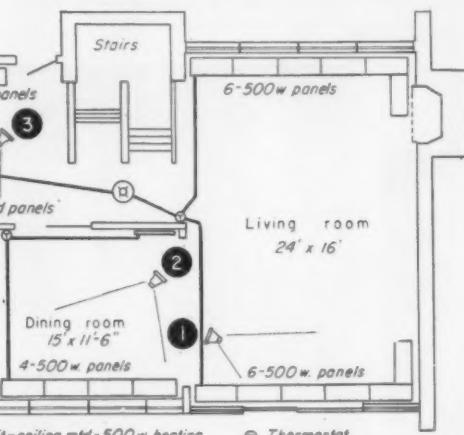
PLAN VIEW of first floor of rectory showing perimeter effect of radiant glass ceiling.



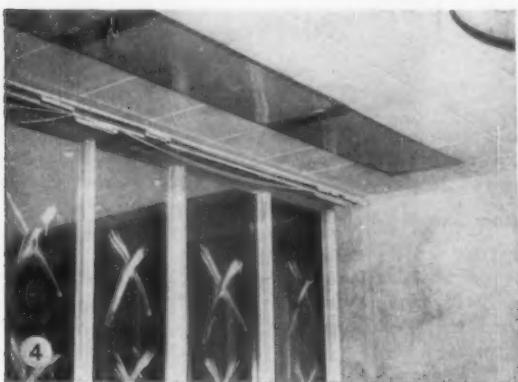
BASEBOARD PANELS on inner partition (three 750-watt units) combine with two 500-watt ceiling panels to heat entrance lobby. All are controlled by corridor thermostat.



ST. SIMEON'S NEW RECTORY at Bellwood, Ill., features all-electric living, including complete electric radiant space heating.



panel heating design. Note individual room thermostatic control of units. Heating for second floor is of similar design. Camera angle indicators identify photos to follow.



TYPICAL BEDROOM has three 500-watt flush ceiling panels in front of windows. Thermostat inside door keeps heat at desired level.

dem arrangement, are mounted in front of window walls to provide a curtain of comfortable warmth between the double-glazed windows and room interiors. The general effect is that of overhead perimeter heating on both floors.

In the first floor offices, groups of 750-watt baseboard type panels are mounted under the windows. In some areas, notably the entrance lobby, base-

board panels on interior partitions supplement ceiling units.

Combination heating and lighting fixtures (Thermolites) are used effectively in corridors, stairways, bathrooms and other small areas. These units provide 500 watts of heating capacity (in the glass bowl) plus 150 watts of illumination in a single suspended fixture. Heating elements operate on 208 volts, lamps on 120

volts. Those installed in corridors and stairways are thermostatically controlled. Those in bathrooms operate from a wall switch with pilot light and act as a supplementary capacity to the 500-watt, thermostatically controlled flush ceiling panel.

Basement rooms and the garage area are heated by a combination of 1000-watt surface type wall units and horizontally suspended panels.



OFFICES ARE HEATED by groups of 750-watt baseboard panels mounted on wall under windows. Control is by room thermostat through transformer-relay in basement.



CLOSEUP OF RELAY unit showing split transformer with movable secondary coil. As coil moves, mercury tube tilts and connects 208-volt feed.



CORRIDOR HEATING and lighting is provided by combination ceiling fixtures. Heating unit (in glass bowl) is thermostatically controlled.



GLASS CEILING PANELS are mounted direct to ceiling supporting members, become flush when plastic-covered ceiling tile is installed.



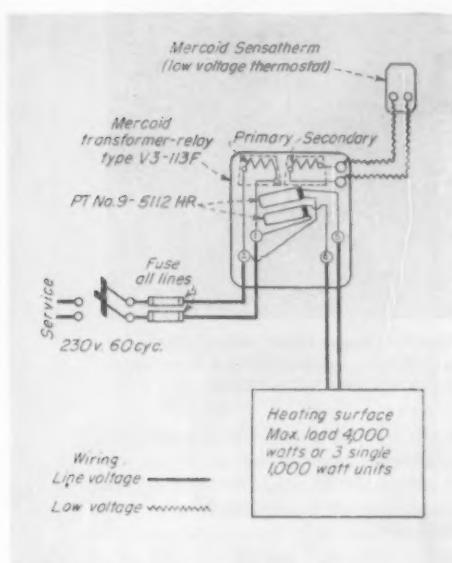
HEATING SYSTEM CONTROL panel in basement has branch circuit breaker panel at right (20 circuits) and three tiers of 31 transformer-relay units at left.



DISTRIBUTION SECTION of 600-ampere, 3-phase, 4-wire, 120-208 volt service equipment has 400-ampere fuses for heating load.



SURFACE PANELS like this 1,000-watt heating unit are used in the basement and garage areas along with horizontally suspended panel.



AUTOMATIC CONTROL CIRCUIT showing connections between thermostat, control unit, line and heating panel. Transformer-relay functions as low-voltage transformer and repulsion relay.

One interesting design note is the addition of some 12½% more heating capacity throughout the building to compensate for the 208-volt system. Heating panels are rated at 240 volts.

Automatic Low-Voltage Control

Control and circuiting for the electric heating system is comparatively simple. Each room, or heating area, has its own 25-volt thermostat mounted on an interior wall or partition. This unit, accurate to plus or minus ½-degree, operates a transformer-relay control unit equipped with mercury-tube contacts. The tube tilts or levels, as the thermostatic circuit opens and closes with temperature change, and throws the group of heating panels connected to it on or off the 208-volt branch circuit.

To avoid possible hum, all transformer-relays are grouped in the basement. Thirty-one controls, in three tiers, are mounted on a board adjacent to the heating circuit breaker panel. Metal wiring troughs below the units carry the 208-volt circuit conductors

from panel to relay and from relay to branch circuit conduits terminating at the heating units. Low-voltage wiring enters conduit above the controls and terminates at the room thermostats. Thermostats used throughout the installation are low-voltage Mercoid Sensatherm types.

Heating branch circuits consist of two No. 10 or No. 12 conductors in conduit, depending upon the load involved and distance from relay to heating unit. Load per circuit is limited to a maximum of 3,000 watts. Generally this means one thermostat and relay per circuit. The few exceptions involve the 6,000 watts of heating in the first floor living room and the connecting study and bedroom directly above. Here, one thermostat actuates two relays controlling the two circuits in each case.

Residents in the rectory are enjoying the convenience of their all-electric home—from the fully automatic, maintenance-free electric heating down to the remote-controlled, motor-operated garage door openers.

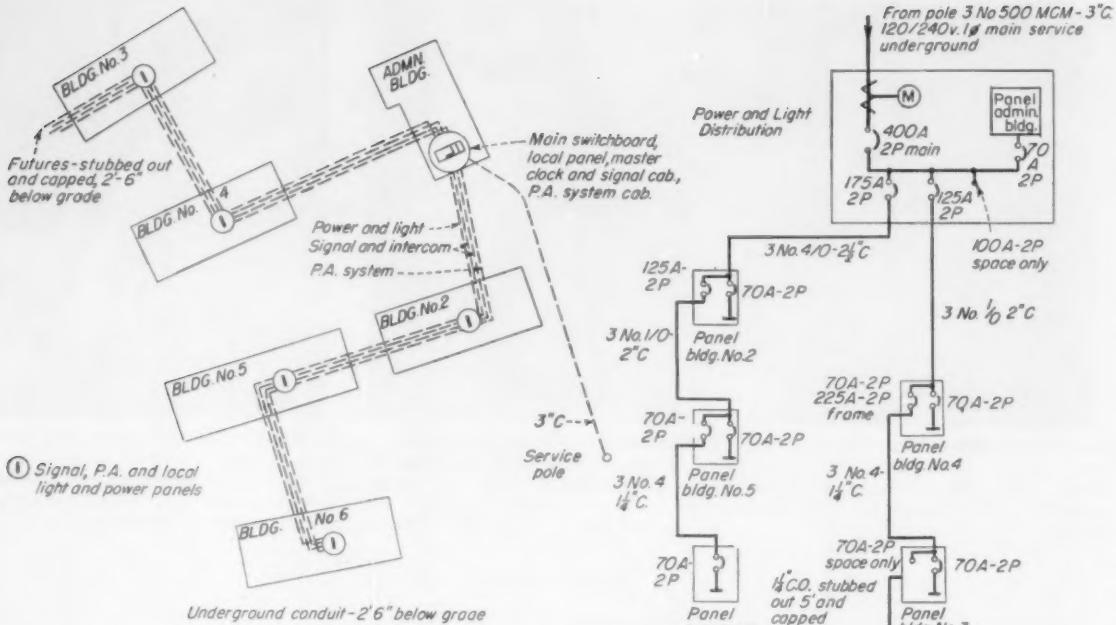


FIG. 1. Plot plan and single-line diagram (right) show service and feeder distribution from the Administration Building.



WIRING A Multi-Unit School

Details of underground distribution and branch circuiting for light and power, intercom and signals at Imperial School, a layout of six, modern, single-level buildings, El Segundo, Calif.

By D. L. Jackson,

Superintendent,
Vancott Co., Electrical Contractors,
Los Angeles, Calif.

A MODERN, functional electrical system today serves a group of six, one-level, slab-based buildings which make up Imperial School, a grammar school in El Segundo, Calif. Electrically, the buildings are tied together by underground wiring from a main distribution center in the Administration Building. Within each building, power, light and signal circuits are fed from local panels. Over-

all, electrical layout of this job represents a pattern for wiring schools of multi-unit type construction, a significant architectural trend in many areas of the country.

Wiring

Underground electric service to the school is made at 120/240 volts, 3-wire, single-phase in conduit from a utility company pole to the main switchboard in the heater room in the rear of the Administration Building. From the pole, 3-inch conduit is run 2 ft-6 inches below the grade, under the floor of the building and up to a 400-amp main switch. Through feeder CBs in the

main board, power is supplied to local panels, one in each building. The local panel in the Administration Building is part of the main switchboard enclosure; panels in the other buildings are fed by underground conduit. Fig. 1 shows the underground conduit runs and a single-line diagram of the distribution system.

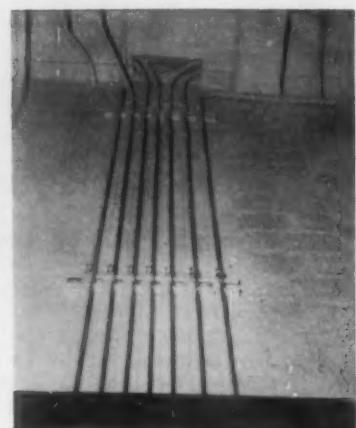
In the Administration Building, the local CB panelboard supplies a connected load of 14.6 kw,—twelve 15-amp circuits and eight 20-amp circuits, for lighting, receptacles, blower motor and power supplies for intercom, P.A. and signal systems. A master clock unit and power supplies for signal systems



MAIN SWITCHBOARD contains 400-amp main switch (lower left), feeder CBs (lower right) and local light and power panel for Administration Building (upper right).



LOCAL PANEL in classroom building is fed by conduit up through the floor; has main CB and branch CBs; supplies circuits in $\frac{1}{2}$ -in. conduit for light and power, 20-A receptacles in $\frac{3}{4}$ -in. conduit.



BRANCH CONDUIT from local panel runs up wall, supported by clamp rack; is run in space above ceiling to various outlets. Layout of home-runs and circuits follows pattern in classrooms.

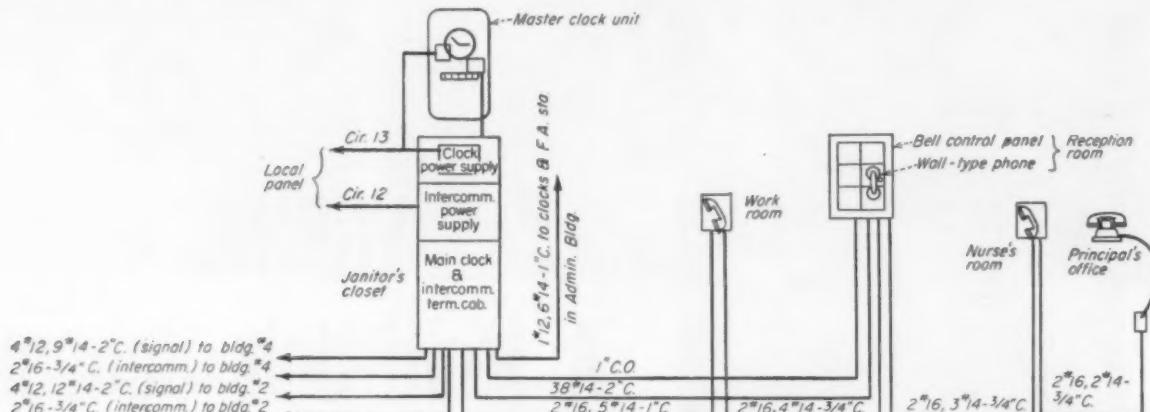
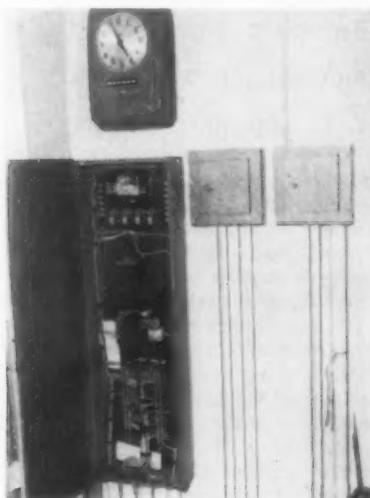


FIG. 2. Hookup detail of intercom phones in Administration Building, showing signal and intercom to other buildings.



MASTER CLOCK, intercom power supply and terminal cabinet (open) and P.A. and telephone cabinets (right) in janitor's closet adjacent to the main switchboard.



BELL CONTROL PANEL (arrow) at reception room desk in Administration building, with wall-type intercom phone mounted on it and private telephone and microphone outlets alongside. See Figs. 2 and 3 for wiring.

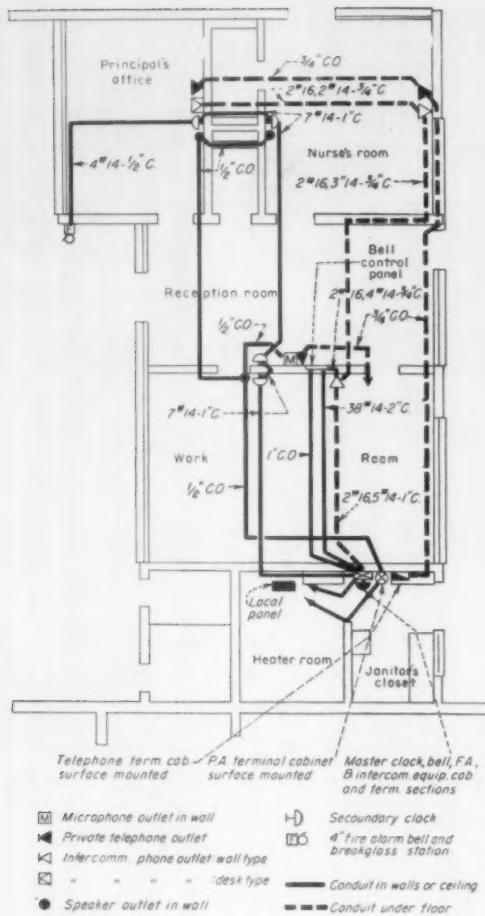


FIG. 3. Floor plan of P.A. and signal systems in the Administration Building.

are mounted in the janitor's closet in the rear of the Administration Building, adjacent to the main switchboard and local panel for this building. Figs. 2 and 3 show the hookup of the signal equipment in the building and the routing of conduit to other buildings.

In just about every detail, wiring in the five other buildings follows a pattern. The local panel for each building, located in a closet off a classroom, divides the electrical load of 11.7 kw between two classrooms, each occupying half of the building. Alongside the local lighting panel are the P.A. system box and the cabinet for signals and intercom. Four underground feeder conduits—1 for light and power, 1 for P.A. and 2 for signals and intercom—come up through the floor slab to the enclosures. 15-amp branch circuits for lighting and blower motors are carried in conduit in the ceiling and walls; two 20-amp receptacles on opposite walls of each classroom are

fed by conduit under the floor. One outside projection horn, one outdoor fire alarm bell and breakglass station, and a secondary clock in each classroom are fed from the signal cabinet. A speaker in each classroom ties in to the P.A. box.

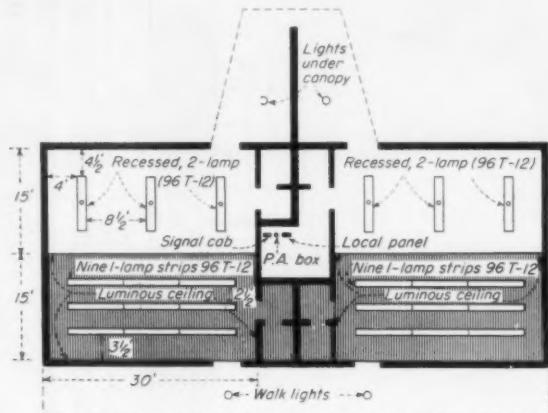
Lighting

In all of the six buildings, modern lighting finds thorough application. In the Administration Building—principal's office, nurse's room, reception room and work room—2- and 4-lamp, Albalite shielded, ceiling-recessed, 6-foot slimline fluorescent fixtures are used in single-unit mountings. At the reception desk, over the bell control panel and P.A. control station, three recessed 100-watt incandescent lens boxes are mounted 8 feet apart.

Lighting equipment and layouts are the same in every classroom. The typical plan for each building is shown in Fig. 4. In each classroom, the ceil-



FIG. 4. Lighting layout in typical classroom building, showing location of panels.



ing is sloped, with the corrugated luminous plastic shielding forming the lower half of the slope. The single-unit troffers shown on the plan are Albalite shielded. Under the canopy on one side of the building, two 100-watt surface mounted incandescent lens boxes light the entrances to the classrooms. 18 of these surface boxes are also used on wide spacings to light the canopied walkways connecting the six buildings. These units are on 2 circuits, one to panel in building No. 3 and the other to panel in building No. 6; wiring is two No. 10s in ½-inch conduit exposed under canopy.

Although simple, the electrical system at this school is flexible and can be readily expanded if the need should arise. From the electrical contractor's standpoint, the overall electrical design adds up to clean, desirable work. Architects of this school were Ralph Flewelling and Walter Moody, Los Angeles, Calif.

PART II—

Old vs New

NEMA MOTOR FRAME DIMENSIONS

1 to 30 HP

Polyphase Wound-Rotor Motors
General Purpose, Foot Mounted—Open Type, 40 C, 60 cycles,
550 volts and less.

(Dimensions in inches. New frame designations and dimensions on gray tone.)



		Frame Number	A (Max.)	B (Max.)	D	E	F	BA	H	N-W	U	V (Min.)	X-A	X-B	X-C
1800	1200	900													
2		224	11	8-3/4	5-1/2	4-1/2	3-3/8	3-1/2	13-3/2	3	1	2-3/4	1/4	1/4	2
—		213	10-1/2	7-1/2	5-1/4	4-1/4	2-3/4	3-1/2	13-3/2	3	1-1/8	2-3/4	1/4	1/4	2
—	1-1/2	213	10-1/2	7-1/2	5-1/4	4-1/4	2-3/4	3-1/2	13-3/2	3	1-1/8	2-3/4	1/4	1/4	2
3	2	215	11	9-1/2	5-1/2	4-1/2	3-3/4	3-1/2	13-3/2	3	1	2-3/4	1/4	1/4	2
5	3	254	12-1/2	10-3/4	6-1/4	5	4-1/8	4-1/4	17-3/2	3-3/8	1-1/8	3-1/8	1/4	1/4	2-3/8
7-1/2	5	284	14	12-1/2	7	5-1/2	4-3/4	4-1/4	17-3/2	3-3/4	1-1/4	3-1/2	1/4	1/4	2-3/4
10	7-1/2	324	16	14	8	6-1/4	5	5-1/4	17-3/2	3-3/8	1-3/8	5-1/8	5/16	5/16	2-3/4
15	10	326	16	15-1/2	8	6-1/4	6	5-1/4	21/32	4-7/8	1-5/8	4-5/8	3/8	3/8	3-3/4
—	15	345	18	16-1/4	9	7	6-1/8	6-1/4	21/32	4-7/8	1-7/8	5-3/8	1/2	1/2	4-1/4
20	—	364	18	15-1/2	8	6-1/4	6	5-1/4	21/32	5-5/8	1-7/8	5-3/8	1/2	1/2	4-1/4
—	7-1/2	326 U	16	15-1/2	8	6-1/4	7	5-5/8	21/32	5-5/8	1-7/8	5-3/8	1/2	1/2	4-1/4
		**						5-1/4	21/32	5-5/8	1-7/8	5-3/8	1/2	1/2	4-1/4

**No previous standard.

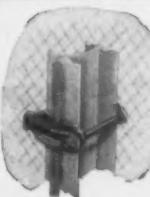
Single-Phase Motors—General Purpose, Foot Mounted—Open Type, 40 C, 60 Cycles, 115 and 230 Volts.

		Frame Number	A (Max.)	B (Max.)	D	E	F	BA	H	N-W	U	V (Min.)	X-A	X-B	X-C
3600	1800	1200													
1-1/2	1	203	10	7-1/2	5	4	2-3/4	3-1/8	13-3/2	2-1/4	3/4	2	3/16	3/16	1-3/8
2	1-1/2	204	10	8-1/2	4-1/2	3-3/4	2-1/4	2-1/4	13-3/2	2-1/4	3/4	2	3/16	3/16	1-3/8
3	2	224	11	8-3/4	5-1/2	4-1/2	3-3/4	2-1/4	13-3/2	2-1/4	3/4	2	3/16	3/16	1-3/8
5	3	223	11	10-1/2	7-1/2	5-1/4	4-1/4	2-3/4	3-1/2	13-3/2	3	1	2-3/4	1/4	2
7-1/2	5	225	11	9-1/2	5-1/2	4-1/2	3-3/4	3-1/2	13-3/2	3	1	2-3/4	1/4	2	2-3/8
—	7-1/2	235	10-1/2	9	5-1/4	4-1/4	3-1/2	13-3/2	3	1-1/8	2-3/4	1/4	1/4	2	2-3/4
		**						4-1/4	17-3/2	3-3/8	1-1/8	3-1/8	1/4	1/4	2-3/8
		236 U	12-1/2	12-1/2	6-1/4	5	5	4-1/4	17-3/2	3-3/8	1-1/8	3-1/8	5/16	5/16	2-3/4

**No previous standard.

**Preliminary—not adopted October 1, 1953.

(Courtesy Westinghouse Electric Corp.)

 <p>TYPE QA-H—Grounds wide range of standard 'H' beam posts to fence fabric and cable. Range of cables parallel to post easily accommodated. Also available for grounding more than one cable. One-wrench installation.</p>	<p>1</p>  <p>TYPE GD—Connects a pair of equal cables or single looped cable to pipe or column. Wide range of cable sizes.</p>
 <p>TYPE GX—Provides a rapid means of connecting crossed cables. Easy to install and inspect. Takes wide range.</p>	<p>3</p>  <p>TYPE GB—Connects range of ground lead cable to flat structural or equipment surfaces. One-wrench installation.</p>
 <p>TYPE GP—Clamp-type ground connector for joining parallel cables at right angle to ground rod, pipe, or column. Range of cable sizes in either groove.</p>	<p>5</p>  <p>TYPE GAR—For connecting wide range of ground cable either parallel or at right angles to rod or pipe. Easily installed by tightening two nuts on U-bolt.</p>
 <p>TYPE GK—Connects three equal ground cables clamped parallel to the rod or pipe. Frequently used to join grounding conductor, grounded member, and looped ground bus at one point. Accommodates wide range.</p>	<p>7</p>  <p>TYPE GG—Joins flat flexible braid or copper bar to ground pipes, fence posts, and columns. Effective for grounding operating rods, switch handles, gate posts.</p>
 <p>TYPE YA (HYLUG) —Compression connector for terminating ground cable to flat surface. Easily, economically installed with Burndy Hypress.</p>	<p>9</p>

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TORONTO, CANADA

54-1

PART III— Old vs New NEMA MOTOR FRAME DIMENSIONS

1 to 30 HP

Single-Phase and Polyphase Flange Mounted Motors, Type D—Open
Type, 40 C₁,
60 Cycles, 550 Volts and Less.

(Dimensions in inches. New frame designations and dimensions on grey tone.)



Frame Number	AJ	AK	BD (Max.)	AH	BC*	BB (Max.)	U	X _A	X _B	Clearance Hole BF Size	Number
203 D and 204 D	10	9	11	2-1/4	0	1/4	3/4	3/16	.3/16	.17/32	4
182 D and 184 D	10	9	11	2-1/4	0	1/4	7/8	3/16	3/16	.17/32	4
224 D and 225 D	10	9	11	3	0	1/4	1	1/4	1/4	.17/32	4
213 D and 215 D	10	9	11	3	0	1/4	1-1/8	1/4	1/4	.17/32	4
254 D	10	9	11	3-3/8	0	1/4	1-1/8	1/4	1/4	.17/32	4
254 UD and 256 UD	12-1/2	11	14	3-3/4	0	1/4	1-3/8	5/16	5/16	.13/16	4
284 D	12-1/2	11	14	3-3/4	0	1/4	1-1/4	1/4	1/4	.13/16	4
284 UD and 286 UD	12-1/2	11	14	4-7/8	0	1/4	1-5/8	3/8	3/8	.13/16	4
324 D and 326 D	12-1/2	11	14	4-7/8	0	1/4	1-5/8	3/8	3/8	.13/16	4
324 UD and 326 UD	16	14	18	5-5/8	0	1/4	1-7/8	1/2	1/2	.13/16	4
364 D and 365 D	16	14	18	5-5/8	0	1/4	1-7/8	1/2	1/2	.13/16	4
324 SD and 326 SD	16	14	18	3-1/4	0	1/4	1-5/8	3/8	3/8	.13/16	4
364 SD and 365 SD	16	14	18	3-1/4	0	1/4	1-5/8	3/8	3/8	.13/16	4

WHEN SELECTING NEMA TYPE D, FLANGE MOTORS

- Refer to tables on polyphase or single-phase motors above for the frame number for the horsepower and rpm rating of the application.
- Refer to table at right for dimensions opposite frame number selected. Other dimensions may be selected from tables above.

Tolerances: (All dimensions in inches)

AK Dimensions:

182D, 286UD; + 0.000, -0.003 inch.
324UD, 326UD, 324SD, 326SD; + 0.000, -0.005 inch.

Face Runout:

182D, 286UD, 0.004-inch indicator reading.
324UD, 326UD, 324SD, 326SD; 0.007-inch indicator reading.

Permissible Eccentricity of Mounting Rabbet:

182D, 286UD; 0.004-inch indicator reading.
324UD, 326UD, 324SD, 326SD; 0.007-inch indicator reading.

Permissible Shaft Runout:

182D, 286UD; 0.002-inch indicator reading.
324UD, 326UD, 324SD, 326SD; 0.003-inch indicator reading.

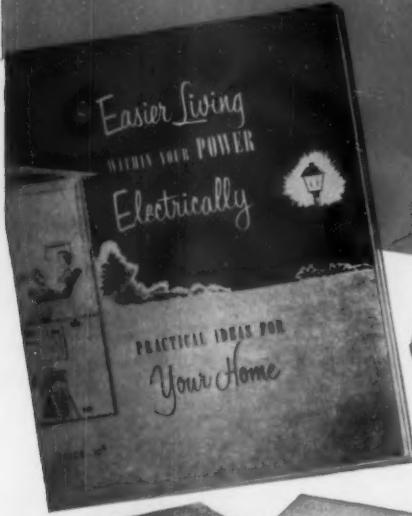
These dimensions may also be applied to vertical motors, in which case the frame designation may have the suffix letters, DV, UD or SDV.
*Dimension **C** is distance from face of the flange to the shoulder of the shaft.

(Courtesy Westinghouse Electric Corp.)

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 "QUIETTE SWITCH" Promotional Folder.
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"Quiette Switch" Folder.

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POSITION _____

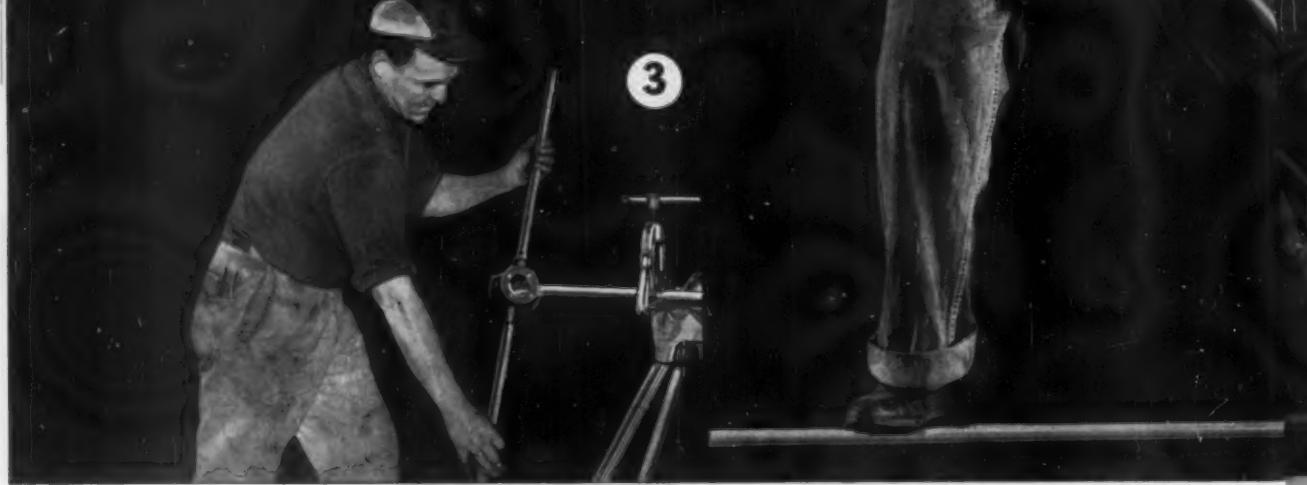
COMPANY _____

CO. ADDRESS _____

CITY _____ ZONE _____ STATE _____

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1. EASIER BENDING. The new G-E White is galvanized by metallizing, a process which bonds a uniform coating of pure zinc to the entire exterior of the conduit. Metallizing eliminates the excessive heat and the quenching and straightening used in other processes. The result is a more ductile conduit.

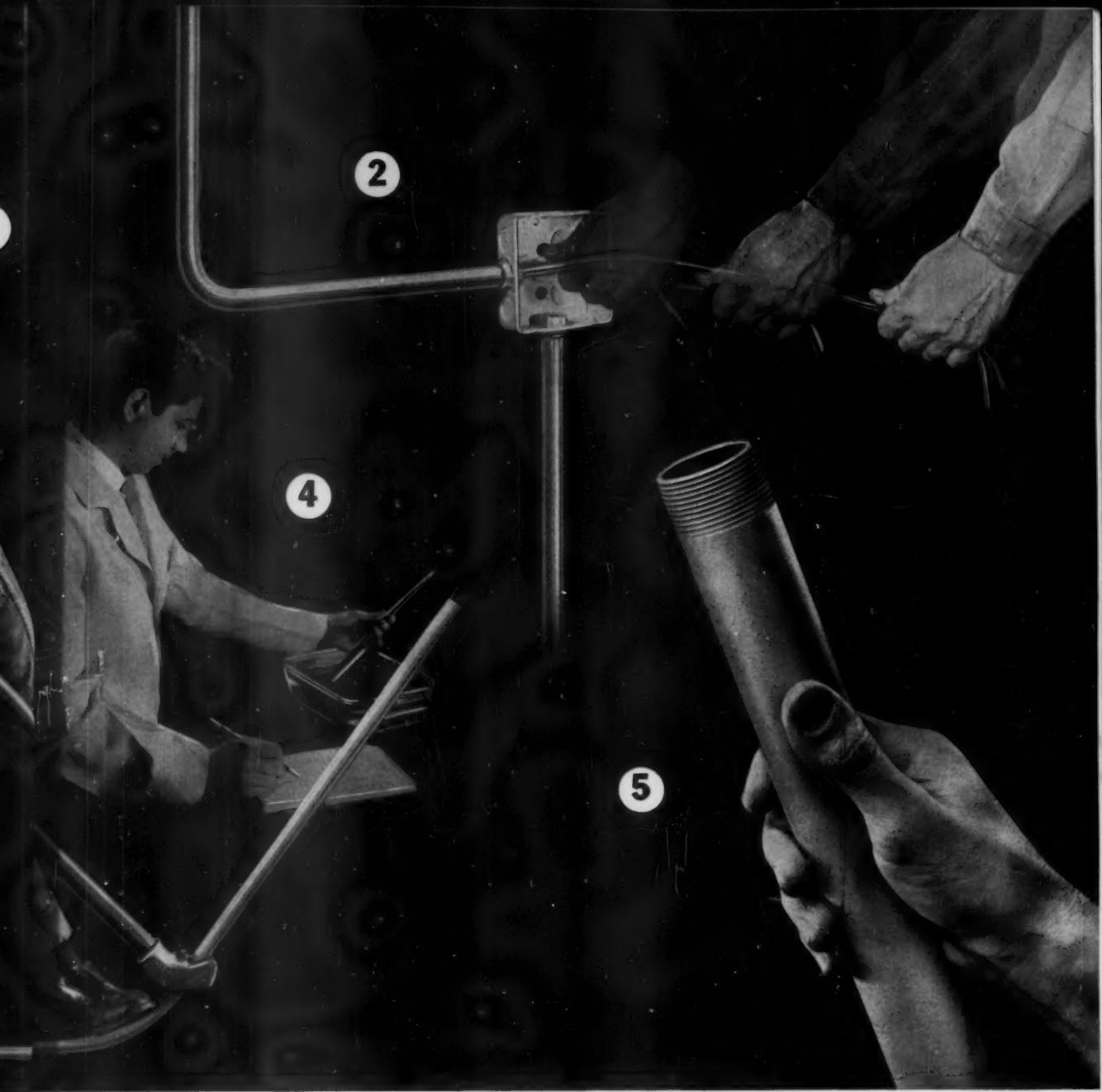
2. EASIER FISHING AND WIRE-PULLING. A new corrosion-resistant inside coating contains a special anti-friction agent. This provides a smooth interior surface that lets wires slide easily, and cuts fishing and wire-pulling time.

3. EASIER THREADING. The metallizing process pro-

duces a unique zinc structure that acts as an ideal cutting lubricant and makes threading at the installation site easier.

4. BETTER CORROSION PROTECTION. Grueling tests prove that new G-E White offers improved resistance to corrosion from smoke, heat, humidity, acid fumes, and salt atmospheres. A coating of C-553 lacquer over the zinc gives extra protection from mechanical damage.

5. ZINC-PROTECTED THREADS. Metallizing also coats the *threads* of new G-E White with zinc—gives added protection both before and after installation.



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New G-E White rigid steel conduit conforms with the American Standards Association Specifications, is listed by Underwriters' Laboratories, Inc., and meets Federal Specification WW-C-581b, dated May 4, 1951. For more information on how

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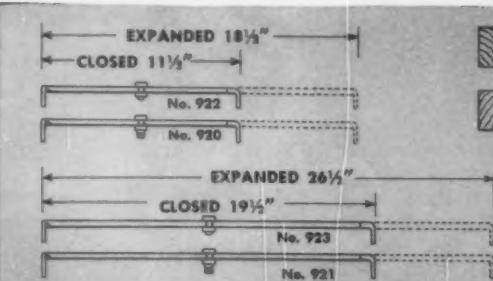


pass every test!

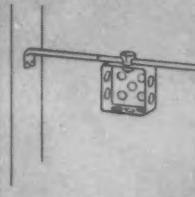
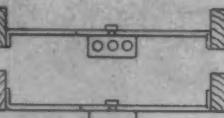


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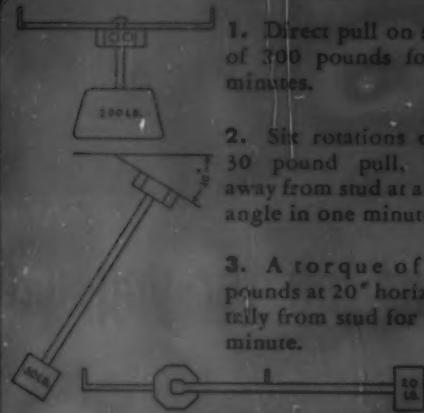
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INSTEAD OF 16



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1. Direct pull on stud of 200 pounds for 5 minutes.

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3. A torque of 20 pounds at 20° horizontally from stud for one minute.

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JOB	Name of job	Beginning Date	Shows length of job and season of year
General Contractor		Ending Date	
Description Type of building, type of construction, number of outlets, etc.		Shows percentage of total cost to overall cost.	
Costs:	Selling Price:	Contributing Factors:	
Material		Wage rates	
Fixtures		Shows rates can be adjusted to show increase if using for present quoting	
Lamps			
Miscel.		Hours Total hours worked	
Sub total →			
Shows percentage of high cost		Extras Above original contract	
Labor			
Total			
Remarks Conduit job - BX job - etc.			

File of Job Records Is Estimating Aid

MANAGEMENT

The Swam Electric Company of Hanover, Pennsylvania, finds that a complete series of job records is of considerable value in estimating on new, similar work; establishing practical cost data, or referring to details connected with formerly completed installation or construction projects. In addition to listing the location of the job, the name of the general contractor, a brief description of the work and the dates of starting and completing the project, the card breaks cost data down into such items as material, fixtures, lamps, special items of unusual value, labor and the total amount of the job. Labor rates existing at the time of the job, total number of hours of labor involved, extras beyond the scope of the original bid and general remarks concerning unusual working conditions are also noted. By referring to these cards when similar types of work are contemplated, these brief notations provide useful information on which up-to-the-minute quotations can be checked.

Heat Detection System Eliminates Fire Hazard

CONTROL

Danger of fire around compressors and other belt-driven equipment has been eliminated in the supermarket chain of Penn Fruit Co. by the use of a simple shut-off circuit operated by a Fenwall Detect-A-Fire unit.

In this system, Fig. 1, the heat detector is mounted just above the compressor drive belt. When either the motor or the belt overheats because of an overload, belt slippage, a frozen shaft, etc., the malfunction generates heat which is carried to the detector by convection currents. The detector-contacts, through a 110 or 220 volt solenoid, then open the power circuit to the entire compressor system.

In the year since the detectors were installed on the more than 75 refrigeration and air conditioning compressors in the 26-store chain, the following benefits have been obtained:

(1) No compressor belt fires have occurred, in contrast to an average of

5-6 fires occurring yearly for the preceding 15 years.

(2) The spoilage of merchandise from water damage has been eliminated. On several former occasions, burning belts had been thrown by the drive motor into some inflammable merchandise, setting off the sprinkler system.

(3) Equipment life has been increased because equipment malfunctions, such as a bad bearing, insufficient lubrication, etc., show up as overheated conditions which are detected before the motor or compressor is ruined.

Formerly, overheating of compressor belts proved a troublesome maintenance problem. Normal wear would gradually stretch the belts, causing them to slip on the drive shaft. The resulting friction would overheat the belt and eventually ignite it. Also, in hot weather the high temperature of both the air intake and compressor cooling water would build up working pressure in the compressors. These excessive head pressures increase belt friction, sometimes to the ignition point. Occasionally, a burning belt would break and be thrown across the room by centrifugal force. This constituted a serious fire hazard in the back of the supermarket where combustible cartons, crates, and groceries were stored. The heat detection system over the compressor belts eliminated these hazards.

The detectors on indoor compressors are set to break the circuit at 140F,

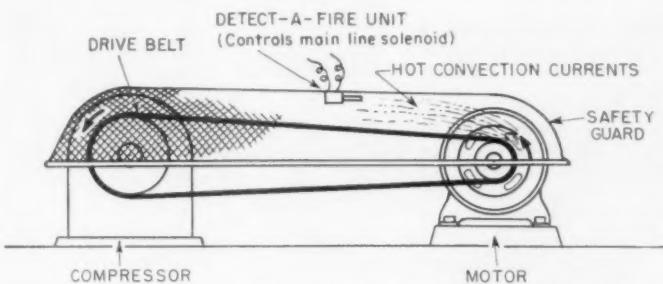


FIG. 1.—Heat detecting unit is located above the drive belt, midway between motor and compressor to sense heat convection currents within the belt safety guard.

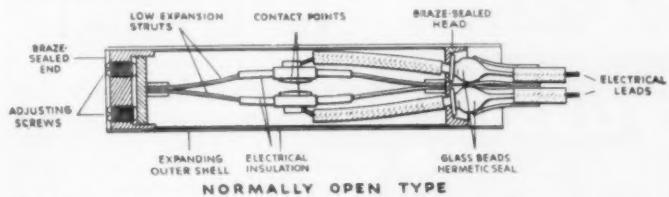


FIG. 2.—Construction details of the heat detecting device.

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Seattle, Washington
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DOSSERT
MFG. CORP.

249 HURON STREET, BROOKLYN 22, N. Y.

SINCE 1904

well under the ignition temperature for the belt, but high enough to avoid false alarms in summer. On outdoor compressors, the detectors are set to actuate at 180°F because of the high ambient temperature in summer. The detector is automatically self-resetting, resistant to shock and vibration, stable, hermetically sealed and will actuate repetitively without any adjustment or resetting. Fig. 2.

All compressor detection circuits in each of the supermarkets are wired in series with the solenoid-operated power switch that controls power to other compressors and fan motors on the heat exchangers. When any one belt overheats, its detector will shut down the entire compressor system simultaneously, so that an overheat condition will attract the immediate attention of store personnel, who can then inform the maintenance department. If store personnel try to restart the system without investigating the cause of an overheat condition, the power will again cut off as soon as temperatures return to dangerous levels. Thus, a motor or compressor with a bad bearing can be protected against extensive damage by being shut off repeatedly.

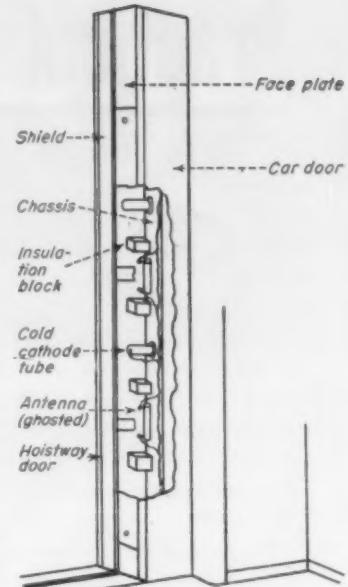
The detection system is easy to install. The Detect-A-Fire has a threaded head which can be fitted into any standard junction box. The junction box is mounted on the underside of the belt-guard about midway between the drive motor and compressor or at any other location over the belt where most of the heat is found to collect. This mounting location can be easily checked by measuring the temperature at various locations above the belt while the motor is running, after the belt has first been loosened to produce slippage and consequent overheating.

This safety cut-off system can be used with any type of belt-driven equipment. However, the belt must be sufficiently enclosed so that the heat will be collected rather than immediately dissipated into the air. For this purpose, the belt should be enclosed on both top and sides by a sheet metal guard. An expanded metal guard will not be satisfactory.

Electronic Detectors Sense Presence of Elevator Passengers

ELECTRONICS

A 3-dimensional "zone of detection" which extends along the leading edges of doors of elevator shaftways and cabs is making it possible to speed service on operatorless cars by "sensing" the presence of passengers moving in or

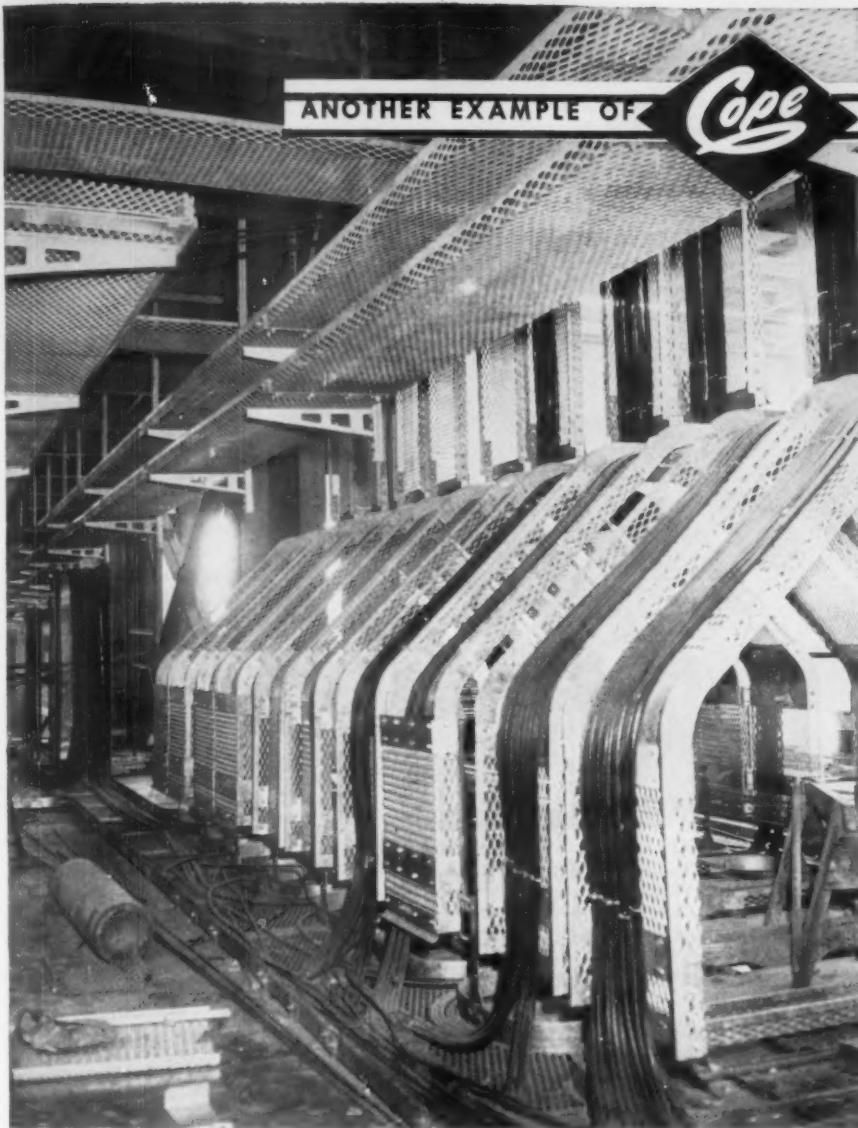


ELECTRONIC DETECTOR is installed inside metal chassis on side of door edge. Unit consists of cold cathode tube and antenna which sends out short wave impulses into a "zone of detection" that precedes the door edges by a few inches. Operating mechanism is covered by black plastic face plate that provides necessary shielding and protects mechanism from tampering, dust and dirt.

out of the cab, then closing the doors as soon as the doorway is clear. These detecting devices are entirely automatic and operate on the principle of short wave transmission, with the "fields of influence" preceding moving doors by a few inches. Therefore, if passengers are crossing the threshold while doors are in the act of closing, their presence will be detected and doors will stop and reverse without striking the passenger. However, since the field of influence is limited to just a few inches, stopping or reversing occurs only when there is the actual possibility of bumping some one or something in the direct path of the doors. If the object in the doorway remains there after several door reversals, the doors are closed at reduced speed until they nudge the object, while a warning buzzer sounds.

Since the zone of detection bridges the gap between hoistway and cab doors, and since it extends from floor level to upper jamb, the device is equally effective in detecting the presence of tall adults or short children alike, crossing either the inner or outer threshold.

Essentially, the detector consists of a series of cold-cathode tubes, electrically connected to metal strip antennas that send out short wave impulses. For center-opening doors, six tube-



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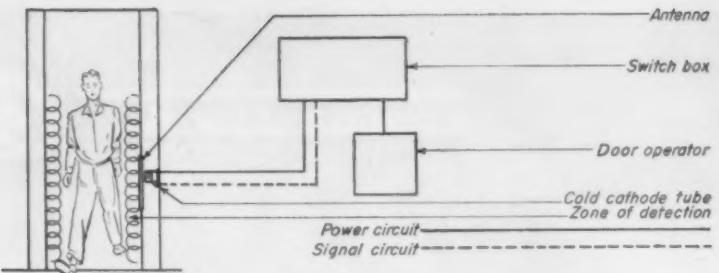
Parr Electric Co., Inc., 48 Austin St., Newark 5, N. J.
Send me your booklet "The Brunt Faultfinder".

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PRESENCE OF PASSENGER in close proximity to door edge produces a signal on the antenna field of sufficient strength to energize the electronic tubes, thereby permitting the passage of activating current to operating relays that control the door-opening mechanisms.



OPERATION OF DOORS is speeded since zone of detection travels with the moving door edges, causing reversal of operation only when slow-moving passenger is about to be touched. Faster door operation results in quicker round trips, more trips per day, greater overall capacity.

antenna assemblies are used to cover the desired area, with three combinations mounted on each side. These tubes are energized only when a door approaches a passenger near enough to "sense" him in the zone of influence and, when the electrical effect of the passenger's body on the antennas results in a signal of sufficient strength to energize the tubes, the tubes permit the passage of current to operate relays that, in turn, control door operating mechanisms.

The entire electrical assembly is enclosed in a shockproof metal chassis which is mounted on the side of the door edge, thereby leaving opened door widths at a maximum. On each hoistway door, an insulated metal shield prevents the grounded door from affecting the sensitivity of the detecting device. The sensitivity, incidentally, may be regulated by adjusting tube controls, making it possible to alter the extent of the zone of detection.

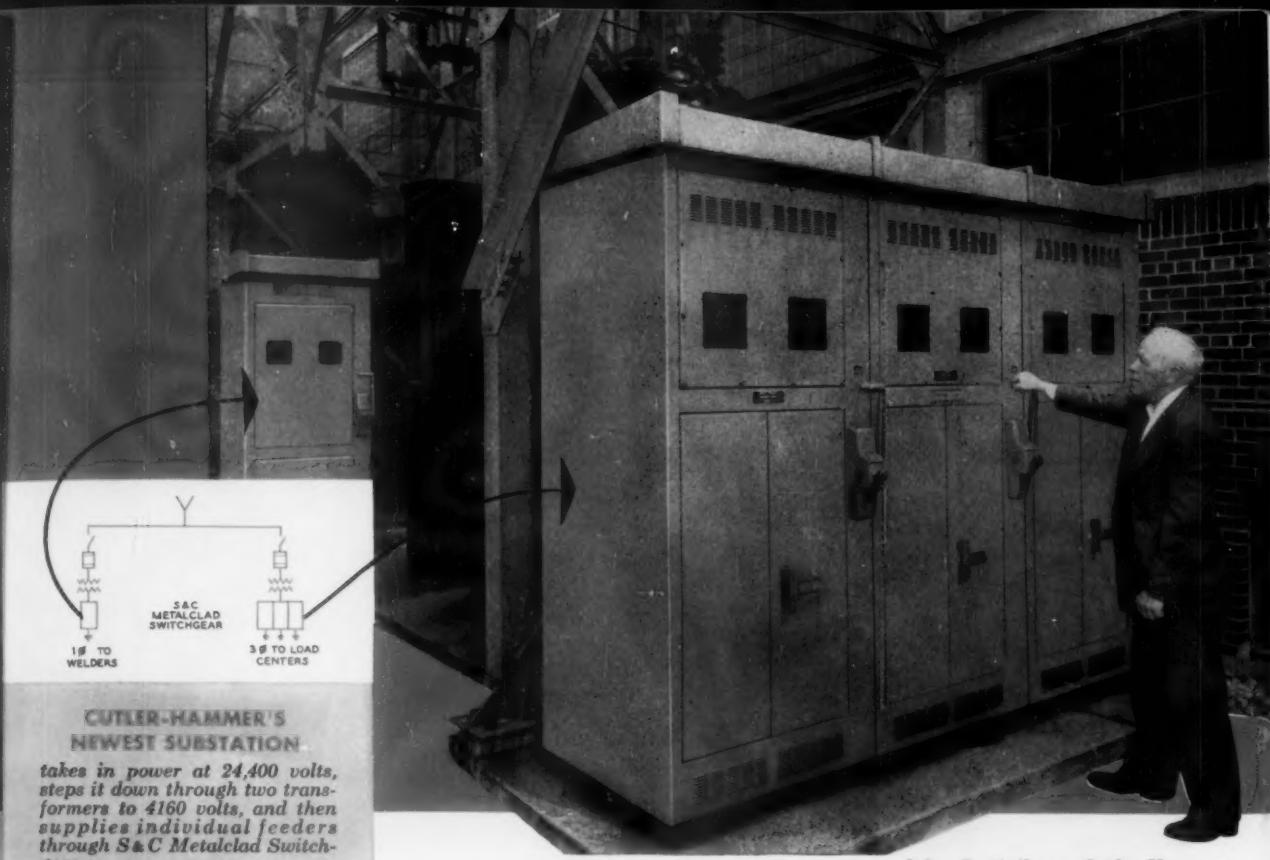
According to Otis Elevator engineers, this electronic detection system has several advantages over systems

formerly in use. As, for example, the mechanical safety shoe mechanism which required actual physical contact to initiate a door's reversal, and the photo-tube system which produced a 2-directional beam at one height only.

Advantages of the electronic detector are many. (1) Door operating time is reduced to the minimum interval consistent with passenger convenience, safety and comfort. (2) The probability of doors interfering with normal passenger movements is reduced and, when door reversals are called for, they are completed smoothly, with minimum inconvenience to passengers, and without striking them. (3) With faster door-closing sequences, cars can make more round-trips per hour and each car can conveniently serve more passengers. (4) Since the electronic detector has no moving parts, maintenance is minimized and necessary adjustments can be made without opening the detector chassis. (5) Since the device is completely automatic, operated by electronic tubes, door operation is not related to human judgment or human fatigue and it is therefore consistent for each cycle. And (6) the "nudging" feature discourages passengers from standing in the doorway, thereby speeding service in still another way.



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When imitations appeared on the market, it isn't a bit surprising that many people called all conduit fittings Condulets. Of course, we appreciate this compliment, but it often leads to confusion. It can be very disappointing if you think you are getting CONDULETS and later discover that the installation was made with a product of some other manufacture.

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Motor Shops



Safety and Convenience Stressed In Shop Layout

Everything pertaining to insulation (such as paper, mica, sleeving, wood and tape) is centrally stocked at Queens Electric Motors, New York, while all equipment required for its preparation (such as saw, cutter, crimper and bander) is located adjacent to these storage bins to facilitate maximum efficiency and minimum effort on the part of the shop worker.

Not only is convenience stressed in

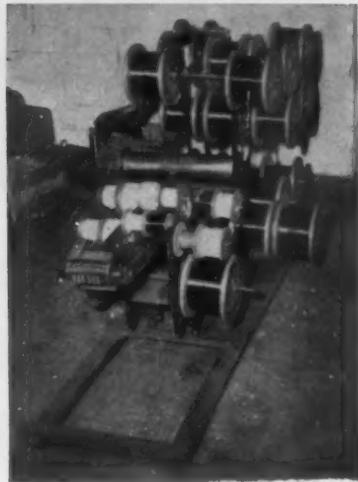
this manner, but safety as well, as indicated by a shop-made circular saw which is table-mounted just to the left of the storage bins. As noted, this saw is covered by a protective hinged hood which parts sufficiently to admit the material being cut, but which protects the operator's hands from inadvertently touching the rapidly spinning saw teeth. Material to be cut is placed in an angle-iron cradle which is constructed in two sections, one on either side of the saw blade, thereby permitting the cradle to move inward without actually coming in contact with the saw.

For accuracy as well as speed, sleepings and the like are bundled together, taped, then cut as a group. One cut makes several lengths, all identical, insuring uniformity.

Multi-Reel Rack Is Timesaver

Wire coil racks of many types and sizes have been shop-constructed and give excellent service. One designed and constructed by Tankersley Electric Co., Montgomery, Alabama, is a typical example, and meets their specific requirements. It is large enough to hold 34 large and 12 small wire reels at one time. Thus various sizes and types of wire are constantly available to effect quick and efficient coil making in this firm's motor repair shop.

Tankersley Electric repairs and re-



LARGE REEL RACK used by Tankersley Electric Co. in Montgomery, Ala. was shop-designed and constructed, holds variety of wire sizes and types, thus saves time and labor.

builds a large number of motors, hence uses production line methods. For this reason it wanted a large reel rack that would hold a sufficient number of reel racks to prevent constant handling of reels and constant replacement.

Thus Tankersley designed and made a multi-reel rack in its own shop which answers these problems. The rack also meets the need for more than one wire in hand as sufficient similar reels can be mounted on the frame.

The rack is made from steel strips welded at the joints. The steel frame is mounted on a wood base and can be moved about the shop with ease. A standard adjustable tension feeder is mounted on the front end of the frame.

An important feature of this rack is that it saves considerable time and labor, as it holds plenty of reels to prevent the necessity of changing reels for each different winding. The rack can be refilled at the end of the shift, if needed, and everything is then in order for the next shift.

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Small motors are spray-painted prior to leaving the Central Armature Works in Washington, D. C., in a compact paint booth equipped with high-velocity exhaust vents and a useful turntable. This table, with a 12-inch-diameter steel bed plate, is mounted on a spindle



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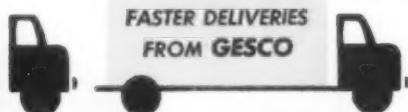


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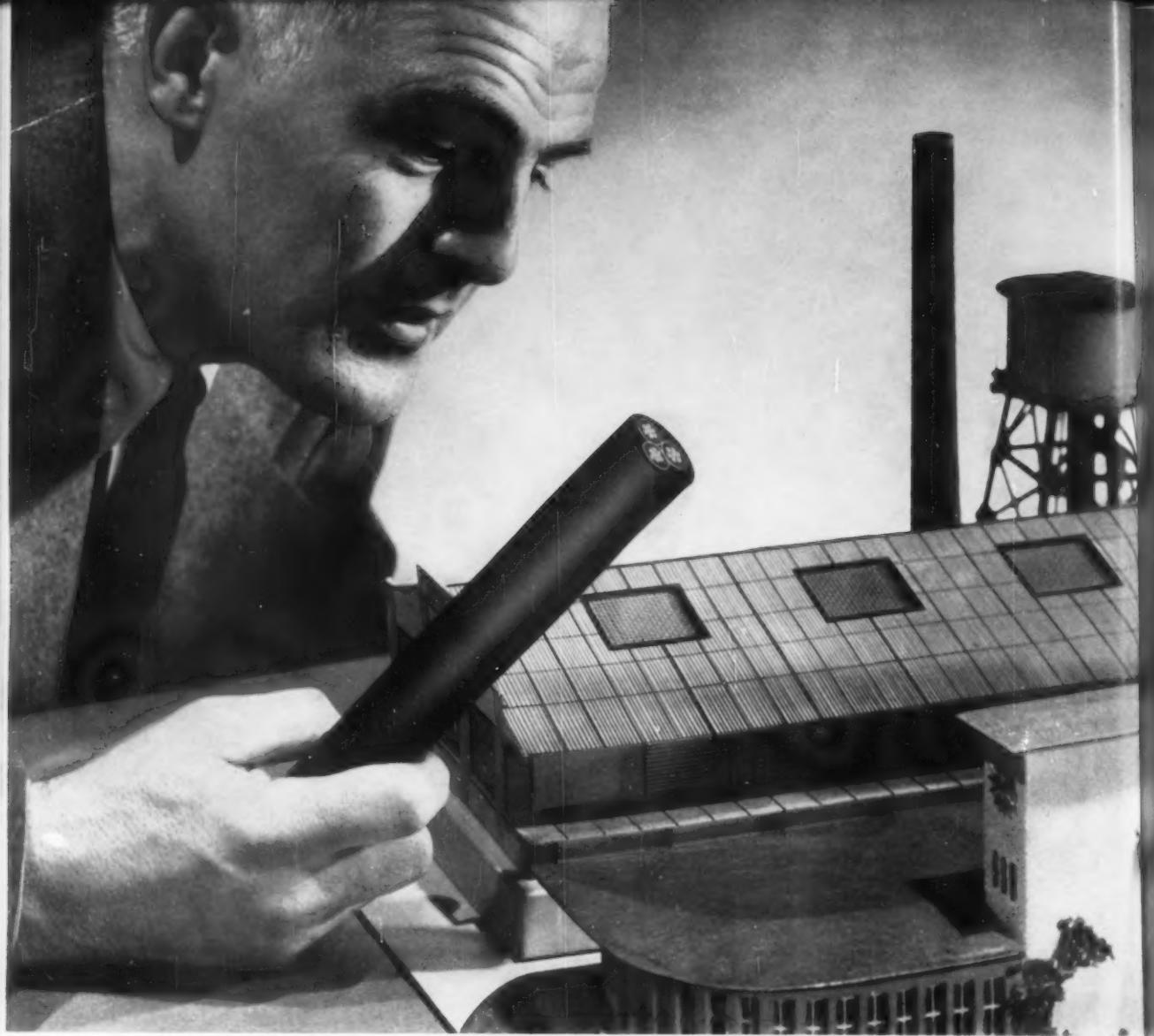
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San Diego	450 Second Ave.
San Francisco	1201 Bryant St.
Stockton	24 No. Aurora St.
COLORADO	
Denver	1429 Eighteenth St.
CONNECTICUT	
Bridgeport	1899 Seaview Ave.
Hartford	2964 Main St.
New Haven	74 Forbes Ave.
Waterbury	23 Nichols Drive
DELAWARE	
Wilmington	310 S. Market St.
DISTRICT OF COLUMBIA	
Washington	705 Edgewood St., N.E.
FLORIDA	
Jacksonville	530 East Forsyth St.
Miami	811 N. W. First Ave.
Orlando	523 North Garland St.
Tallahassee	705 So. Woodward St.
Tampa	514 South Morgan St.
GEORGIA	
Albany	410 Hodges Ave.
Atlanta	172 Haynes St., S.W.
Augusta	1448 Reynolds St.
Savannah	301 E. Bay St.
IDAHO	
Boise	618 S. 8th St.
ILLINOIS	
Chicago	845 S. Clinton St.
Peoria	800 South Adams St.
Rockford	810 20th St.
Springfield	1007 E. Jefferson St.
INDIANA	
Evansville	2000 North New York Ave.
Fort Wayne	1609 So. Calhoun St.
Hammond	506 Fayette St.
Indianapolis	250 Stadium Drive
Muncie	204 E. Willard St.
South Bend	424 East Monroe St.
Terre Haute	801 Poplar St.
IOWA	
Des Moines	108 East 4th St.
KANSAS	
Topeka	115 Jackson Street
Wichita	800 E. First St.
KENTUCKY	
Harlan	Hoskins St.
Lexington	309 North Ashland Ave.
Louisville	2311 So. Brook St.
Paducah	301 S. Second St.
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New Orleans	4221 Bienville St.
Shreveport	1430 Dalzell St.
MAINE	
Bangor	840 Hammond St.
Portland	170 Anderson St.
MARYLAND	
Baltimore	1500 Barclay St.
Hagerstown	1095 Jefferson Blvd.
MASSACHUSETTS	
Boston	145 North Beacon St.
Springfield	484 Worthington St.
Worcester	163 Mechanic St.
MICHIGAN	
Detroit	680 Antoinette St.
Flint	4705 No. Dort Highway
Grand Rapids	305 Fulton St., W.
Kalamazoo	112-114 Parkway Ave.
Lansing	428 N. Grand Ave.
Saginaw	125 Davenport St.
MINNESOTA	
Duluth	102 W. Michigan St.
Minneapolis	63 S. 13th St.
St. Paul	174 E. 6th St.
MISSISSIPPI	
Jackson	610 Gesco Place
MISSOURI	
Cape Girardeau	402 S. Sprigg St.
Joplin	922 Pennsylvania Ave.
Kansas City	2101 Broadway
Springfield	1301 W. Webster St.
St. Louis	2653 Locust St.
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Billings	2710 Montana Ave.
Butte	900 E. Front St.
NEBRASKA	
Omaha	914-20 No. 18th St.
NEW HAMPSHIRE	
Manchester	57 Bedford St.
NEW JERSEY	
Newark	254-284 Elizabeth Ave.
Paterson	561 E. 31st St.
Trenton	Brunswick Circle Extension
NEW MEXICO	
Albuquerque	820 No. First St.
NEW YORK	
Brooklyn	135 Kent Ave.
Buffalo	960 Busti Ave.
Hicksville	Broadway & Fourth St.
New York	585 Hudson St.
Niagara Falls	11th St. & Whitney Ave.
Rochester	67 Mortimer St.
Yonkers	16 Harrison Ave.
NORTH CAROLINA	
Asheville	47 Rankin Ave.
Charlotte	700 Tuckasegee Road
Fayetteville	461 Robeson St.
Greensboro	1111 Willowbrook Drive
Greenville	200 Hooker Rd.
Raleigh	800 W. Poole Ave.
OHIO	
Akron	225 East Mill St.
Canton	123-5 Sixth St., S.W.
Cincinnati	215 W. 3rd St.
Cleveland	4958 Woodland Ave.
COLUMBIA	
Columbus	146 N. 3rd St.
Dayton	601 E. 3rd St.
Portsmouth	1723-27 Tenth St.
Toledo	28 No. St. Clair St.
Youngstown	265 West Haven Ave.
OKLAHOMA	
Oklahoma City	127 E. California Ave.
Tulsa	14-18 N. Guthrie St.
OREGON	
Medford	121 W. 4th St.
Portland	300 N. W. 14th Ave.
PENNSYLVANIA	
Allentown	1249 Liberty St.
Erie	824 E. 9th St.
Johnstown	80 Hickory St.
Philadelphia	429 N. 7th St.
Pittsburgh	200 West River Ave.
Reading	447 N. Front St.
Scranton	204 Monroe Ave.
West Phila.	3417 Garrett Rd., Drexel Hill
Wilkes-Barre	85 Union St.
RHODE ISLAND	
Providence	Harris Ave. & Acorn St.
TENNESSEE	
Chattanooga	112-114-116 W. 13th St.
Johnson City	425 W. Walnut St.
Knoxville	701 W. Jackson Ave.
Memphis	500 South Front St.
Nashville	90 Peabody St.
TEXAS	
Abilene	190 Locust St.
Amarillo	701-711 E. 5th Ave.
Beaumont	1295 Pearl St.
Corpus Christi	1134 E. Port Ave.
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El Paso	300 Dallas St.
Fort Worth	409 Jones St.
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San Antonio	1801 Broadway
Tyler	416 No. Broadway
Waco	217 So. Fourth St.
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Salt Lake City	312 W. 2nd South St.
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Richmond	709 E. 26th St.
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WASHINGTON	
Seattle	515 Norfolk Ave., S.W.
Spokane	1212 First Ave., S.
Tacoma	1805 Trent Ave.
WEST VIRGINIA	
Wheeling	2316 A St.
WISCONSIN	
Appleton	116 W. Harris St.
Eau Claire	515 Wisconsin St.
La Crosse	222 Pearl St.
Milwaukee	540 S. First St.
WYOMING	
Casper	428 So. Elm St.

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3454

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SUPPLY COMPANY**

A DIVISION OF GENERAL ELECTRIC DISTRIBUTING CORPORATION



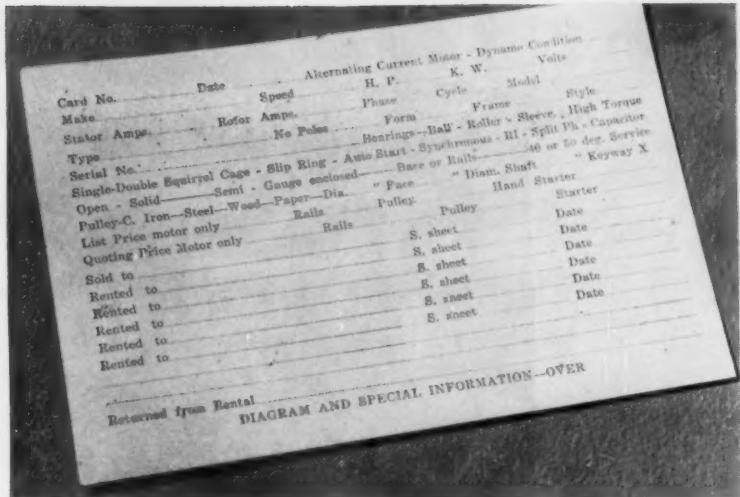
PULLEY BEHIND BOOTH turns circular bed-plate upon which the motor being spray-painted rests. Even coating of paint and absence of smudge-marks result.

which passes through the bottom of the booth and is equipped with a small-diameter pulley. A larger pulley is mounted beneath the front edge of the spray-booth, and a belt, passing over the two grooved sheaves, makes it possible to revolve the turntable by rotating the large pulley beneath the booth.

Motors can thereby be revolved at will, facilitating the application of an even coat of paint or lacquer. It makes it possible to reach all surfaces, insures the absence of finger marks that occasionally were a by-product of turning the motor by hand, and the operators do not now get paint on their hands or clothing.



AT NISA EXHIBIT at Plant Maintenance Show in Chicago (L to R) E. D. Stevens, Economy Engineering Co., Chicago; R. A. Watson, AT&SF Railroad, Chicago; G. F. Glave, president Central District Chapter NISA (Chicago); and L. E. Peterson, Socony Vacuum Oil Co., Cicero, Ill., check service offered by electric motor repair shops.



System for Inventory Control

A simple system of perpetual and physical inventory is used for precise control of stocks of motors, parts and materials at Stewart Electric, New Orleans, La. The system gives a clear continual picture of the amount and type of equipment on hand throughout the three-floor building which houses this electric motor maintenance shop. Evolved over many years, the system combines perpetual inventory cards on motors, monthly counts of wiring and other materials and a yearly physical count of everything contained in the shop.

The illustration shows the type of card which is filled out and filed for each motor in stock. Front of the card has complete history of the motor, with all its uses and travels; the back has cost and price figures. As soon as new motors come in, their case history cards are filled in. White cards are used for ac motors, yellow cards for dc motors. These cards are filed according to types and sizes of motors. When a motor is sold, its card is transferred to a separate file. For easy reference, a permanent record of motor sales is maintained in a "sold book" which shows who bought the motors, what kind of motors were bought and when they were bought. Should they be returned for repair, all necessary data is at hand.

Wire, parts, accessories and other materials are checked by physical count once a month. Purchasing for the month ahead is planned on the basis of quantity on hand versus the previous month's needs.

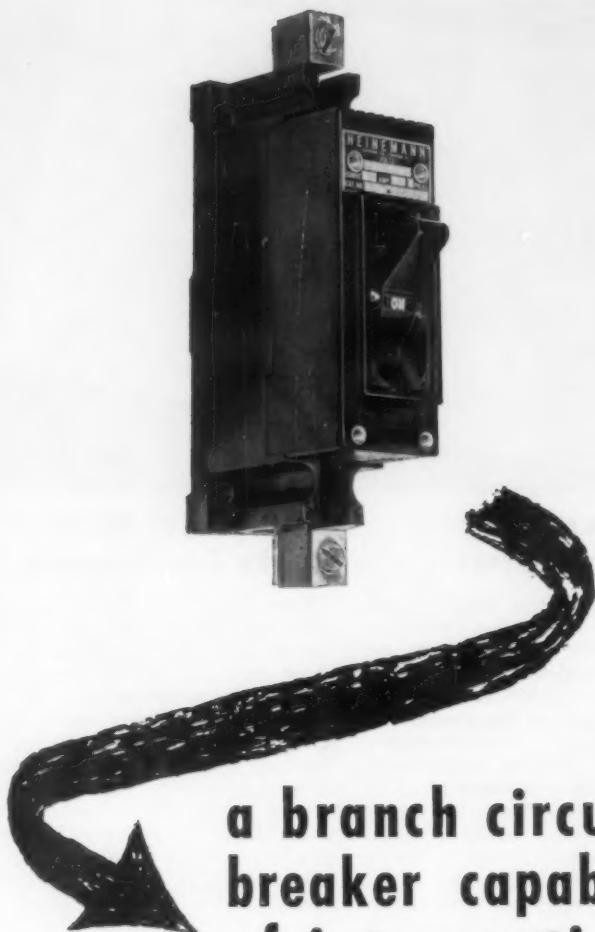
In addition to facilitating their own handling and stocking of equipment, the inventory system has proved very effective in clearing up customer misunderstandings.

Six-Diameter Shaft Checks Fan Trueness

When fans are overhauled and repaired in the shop of the Central Electric Company, Cambridge, Mass., blades are checked for balance and symmetry by a simple bench device combining a multiple-diameter shaft and a semaphore arm, which may be raised or lowered and moved inward or outward at will. The shaft, made from a length of bar stock having an initial diameter of $\frac{3}{4}$ of an inch, has been turned down so that now it is stepped down at either end, thereby containing six different diameters (ranging from the initial size down to $\frac{1}{4}$ -inch). These six diameters correspond with all standard fan shafts so that, while testing the trueness of a fan-blade assembly, it can be slipped over the shaft having the proper dimension.



FAN BLADES are revolved slowly on this shaft which has been milled to six different diameters. Static unbalance is quickly detected, while blades out of line are located through the use of a pivoted semaphore mounted to the rear of the test bench.



**a branch circuit
breaker capable
of interrupting
10,000 AMPERES**

Here, at last, is a single-pole panelboard-type circuit breaker designed for today's requirements. It has the sturdiest construction, the smoothest switching action and the fastest short circuit interruption of any branch circuit breaker available.

The HEINEMANN General Purpose Panelboard Circuit Breaker also has a standard interrupting capacity of 10,000 amperes at 120 volts, AC or 5,000 amperes at 250 volts, AC—extremely high considering its size. *Even beyond this . . .* it has a *one-time* safe interrupting capacity of 20,000 amperes at 120 volts, AC or 10,000 amperes at 250 volts, AC. Such a large interrupting capacity may have been needless in the past, but it is a practical requirement with present-day electrical distribution systems. The modern practice of high capacity buses to branch circuit panelboards makes short circuit currents of such magnitude quite possible.

In addition, Heinemann Circuit Breakers operate on the hydraulic-magnetic principle. They employ no thermal elements, thus de-rating is never necessary. In effect, Heinemann provides greater, safe, usable capacity in branch circuits with the same wiring because the circuit breaker capacity is not affected by ambient heat or cold.

Send for Bulletin 3410
HEINEMANN ELECTRIC CO.
132 Plum Street, Trenton 2, N.J.

HEINEMANN
Circuit breakers

sions. Then, since the shaft is supported by ball bearings and rotates freely, a fan blade that is not in static balance will reveal this condition while it is slowly revolved.

During this process, the bar of the semaphore is raised and moved inward toward the revolving blades until it just touches. If one of the blades is not in line, it will either strike the semaphore arm before the other blades do, or it will miss it entirely. Knowing these two facts, the worker can then bend the blades back into a true plane, and can balance the assembly by minor filing or addition of solder where indicated.

**Coil Leads Readied
At Central Location**

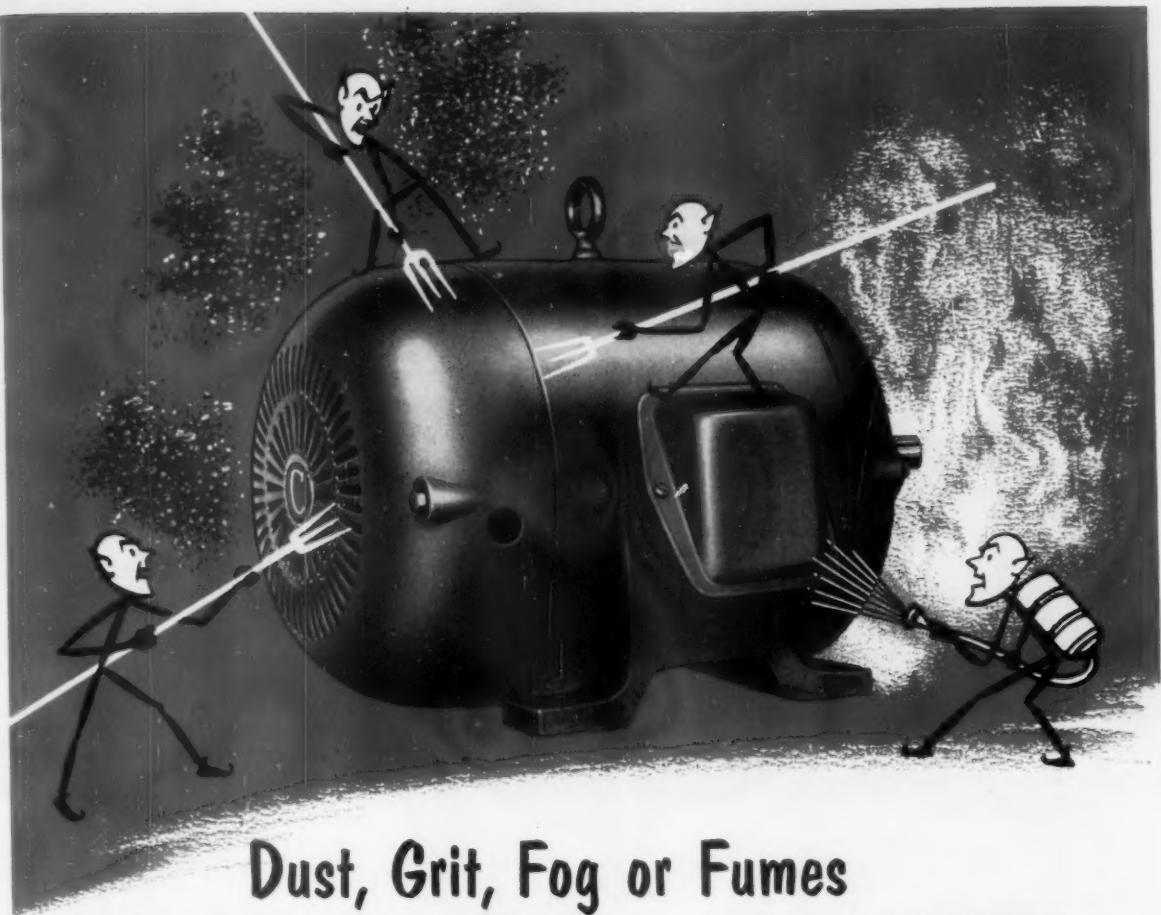
Related operations connected with the preparation of strap wire coil leads are located in close proximity to each other, thereby eliminating travel from one machine to another and greatly spreading the finishing procedures in the Penn Electric Coil Corp., Pittsburgh, Pa.

For example, coil leads are stripped of insulation in a wire Skinner, the ends are tinned and annealed, and they are cut out to pre-determined lengths, all operations being performed within a few feet of each other. In fact, the wire Skinner, tin dipping pot and revolving brush enclosure for removing excess tin from the leads are incorporated as an integral unit, with the tin pot located on the front and at the bottom of the Skinner, and the Skinner and brush arrangement both served by a common exhaust unit. Coils are formed, compressed and cut on adjacent work benches so that the entire procedure is a localized, convenient, rapid series.

Cutting out wasted steps reduces fatigue and increases production.



STRIPPING OF INSULATION, tinning of leads and removing excess tin from leads is accomplished in one central location.



Dust, Grit, Fog or Fumes CAN'T GET UNDER THE "SKIN"

of your *Century*

**TOTALLY
ENCLOSED
FAN
COOLED MOTORS**

The inner frame of your Century TEFC Motor completely seals all the vital working parts against air-borne hazards. An effective stream of air blown between the inner and outer frames, keeps the motor temperature within safe limits at rated load.

Century TEFC motors operate your equipment efficiently in any kind of atmosphere — resist dusts, dirt, chemical or oil fog, and mists.

Whatever the job or working conditions, Century's wide line of types, sizes, and variety of operating characteristics, enables you to select the motor specifications for top equipment performance.

½ to 400 horsepower ratings — A.C. or D.C. — Furnished in Drip Proof — Splash Proof — Dust Proof — or Explosion Proof frames — for most all atmospheric surroundings.

Specify Century motors on your new equipment or replacements. Your nearby Century District Sales Office or Century Distributor will be glad to give you full information.



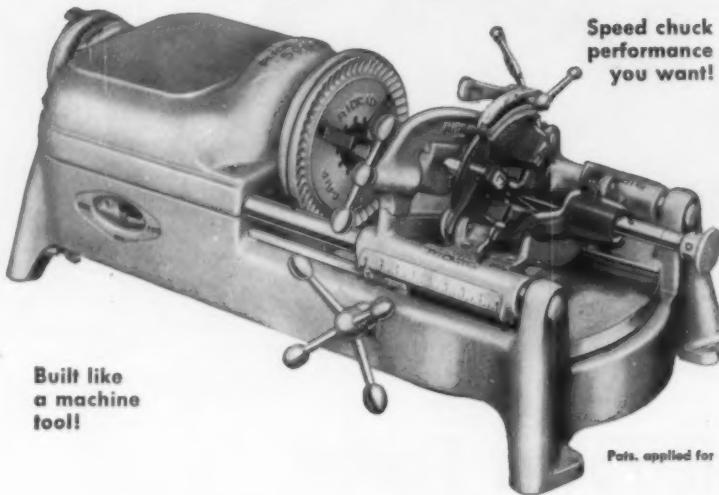
CENTURY ELECTRIC COMPANY • 1806 Pine Street, St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

CE-781

Now!... New 500A

RIDGID

Pipe & Bolt Threading Machine with New Speed-Grip Chuck



Built like
a machine
tool!

**Entirely new principle of gripping conduit
Not just another hammer chuck**

★ Speed-Grip Chuck guaranteed to hold any kind of pipe or conduit securely both ways, *forward and reverse*.

★ No slipping, even in driving geared tools.

New "500" threads, cuts, reams with top work-saving ease—ready in seconds to work any kind or size of pipe or conduit, $\frac{1}{8}$ " to 2", bolts $\frac{1}{4}$ " to 2". Power for geared tools to 12". Independent operation of tools. Quick-opening die heads—quickest possible set-up. With new Speed-Grip Chuck, No. 500A; with lathe-type wrench chuck, No. 500. Conduit and special dies on request. See it at your Supply House!

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

★ Easy to operate: close grip-tooth jaws on work with hand wheel, sock it lightly—motor action makes it hold still tighter.

★ Releases easily by turn of hand wheel.



Tool Outlines Aid Visual Inventory

The old adage, "A place for everything and everything in its place", is a very sensible motto to practice in a motor repair shop, where time wasted while searching for tools means slashed profits and plant efficiency. At Queens Electric Motors, New York, tools are stored on plywood panels, with each tool having its proper location, as indicated by a painted outline beneath the suspending hooks. Shop workers quickly become familiar with these relative positions, making selection of tools an easy assignment and, with the outlines as a reminder, the tools can be returned to their exact storage spot at the end of a job or at the end of the day. At the end of each working day, therefore, a visual inventory is automatically taken, missing tools are instantly noted and can be traced, located and replaced before they are forgotten or lost. This method of storage results in a neater shop, the elimination of wasted time, and the prevention of lost tools.



ESTIMATING BACKBONE of the Vancott Electric Co., Los Angeles, Calif., is the father and son team of Enoch Jackson and son, Dan, who is superintendent on Vancott's work.





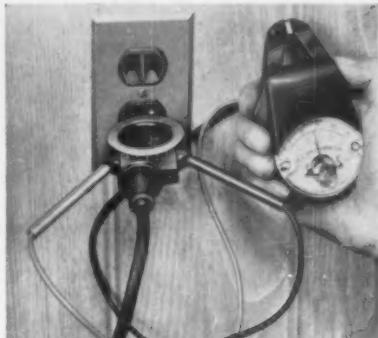
Check appliance current at receptacle



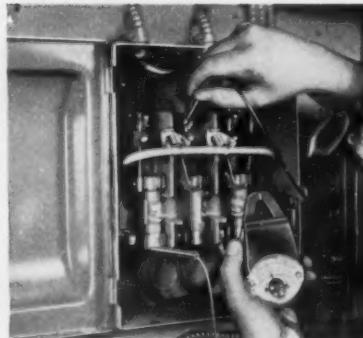
Trouble-shoot relays quickly



Instantly determine hot leg of receptacle



Check appliance voltage at receptacle



Instantly determine if fuses are good



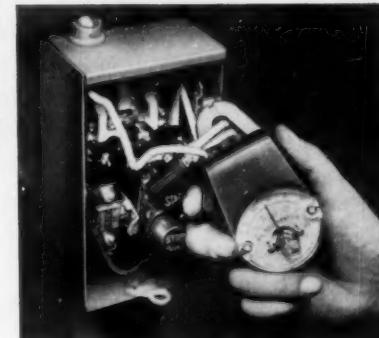
Know if the load is balanced



Know if windings are grounded



Check capacity of motor capacitors



Expand low-amp reading by doubling lead

Eliminate Guesswork!

One pocket tester measures voltage and current, with instrument accuracy, without shutting down equipment!

And the cost is only \$19.85 (just a few dollars more than an ordinary voltage tester), so every man can carry one!

Pick the Amprobe Junior that fits the job. 7 models from 0-10 amps to 0-100 amps; choice of either 0-125/250 volts A-C or 0-150/600 volts A-C range. For your higher current applications, multi-range Amprobes available for 300, 600 or 1200 amperes.

See the full Amprobe line of snap-around volt-ammeters at your jobber's today.

Send for valuable Amprobe service bulletins showing many more ways to save time and money on the job with an Amprobe. Mail coupon now to: PYRAMID INSTRUMENT CORP., LYNBROOK, N. Y. (Export Div.: 458 Broadway, N. Y. 14), world's largest manufacturers of snap-around volt-ammeters.

Amprobe Jr.®
snap-around volt-amp tester **\$19.85**

Send for these free Amprobe service bulletins:

Pyramid Instrument Corp.,
Dept. ECM 3-4, Lynbrook, N. Y.

Please send me the Amprobe service bulletins checked below:

- UL wiring standards, room conditioners
- Trouble-shooting electric motors
- How to cut costs and land more jobs
- Portable test instruments

NAME _____

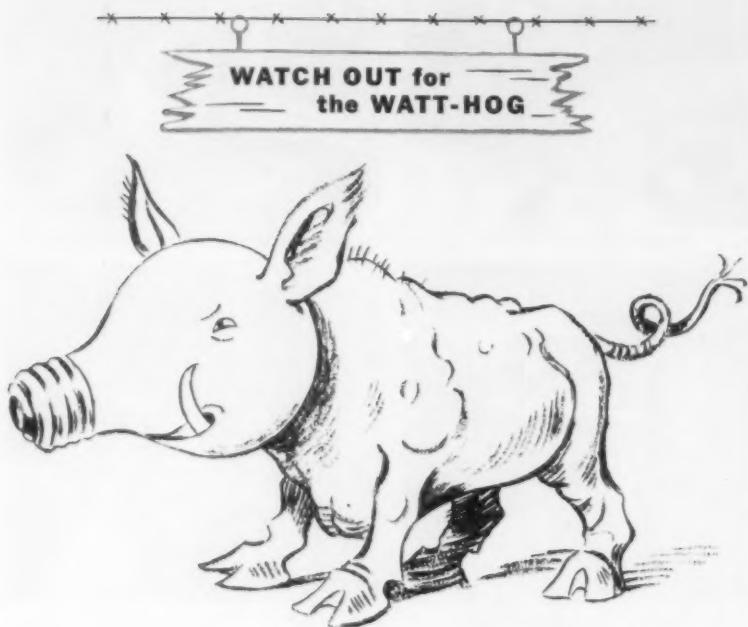
COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

BEST LIGHTED HARNESS TRACK

[FROM PAGE 87]



Does this Watt-hog with his dim and dirty face root you out of good light and decent maintenance economy? Not if you follow the suggestions in the *Champion Maintenance Manual** and make a practice of buying the right lamps — efficient, long-lasting *Champion Lamps*.

*Your name and company address on a postcard will bring you a free copy by return mail.



CHAMPION LAMP WORKS
594 Broad Street, Lynn, Massachusetts



recommendation) on the backstretch to approximately 350 at the finish line, it was necessary to install more than 700 floodlights around the track perimeter, along the starting chute and atop the grandstand. In addition, 1500-watt floodlights were installed at the paddock and parking area, bringing the total of floodlight units up to 865.

The track proper is ringed by 25 poles, approximately 200 feet apart, each supporting 24 general service 1500-watt PS52 lights operating at 10% over-voltage in order to obtain a third more lumen output. An additional 8 poles, each one supporting a bank of 32 lights, are located along the chute and grandstand terrace. The finish line is illuminated by six 1500-watt floodlights similar to those positioned around the track and, in addition, by four 3000-watt, 32-volt mogul bipost T32 aviation service lamps in searchlight units mounted on the roof of the grandstand, 50 feet above the ground.

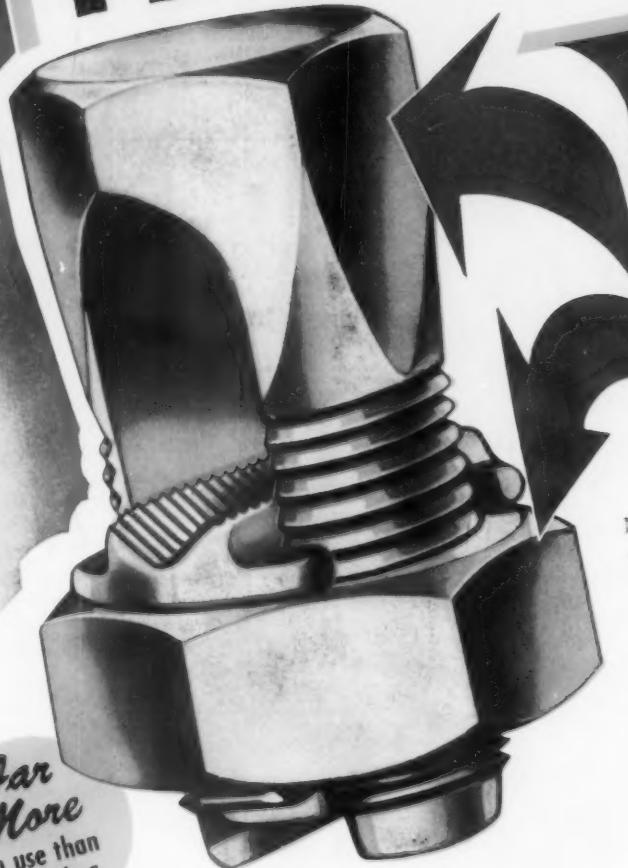
This method of illuminating the finish line differs from standard practice in that most tracks use four 10,000-watt 115-volt searchlights. However, by substituting three lower-voltage lamps, nearly three times more light output was obtained. Due to shorter lamp life, these units are turned on only during the intervals of actual racing, and then only at half power up until the time when the leading horse enters the home stretch. Full power is then supplied.

Initial aiming of floodlights was in accordance with results obtained by superimposing distribution patterns on scaled grid charts of the track. This was performed during daylight hours, using a peep sight and small frosted spot in the center of the cover glass, plus two quadrants. Minor final adjustment was made after dark using actual obtained lightmeter readings as the criterion.

The grandstand is generally illuminated by use of standard 500- and 200-watt filament lamps in RLM reflectors. Those located over aisles and exits are connected not only to normally-used utility-powered distribution centers, but to an auxiliary 25-kva, 120/208-volt generator as well, thereby obtaining insurance against complete outage in the event of a utility power interruption. Automatic transfer provisions make the operation of this emergency unit independent of manual attention.

Approved
by
UNDERWRITERS
LABORATORIES

Here's the **MOST
PRACTICAL** design



LARGER SURFACES

to grip with wrenches from
ANY ANGLE—using either a
socket or open-end wrench.

MORE STRENGTH. In competitive torque tests, Penn-Union Split-Bolt Connector withstands 15% to 55% higher clamping pressures.

MAXIMUM CONTACT provided by V-groove; conductors protected by bevelled slot.

PRECISION MADE, with rigid inspection. Smooth accurate threads assure maximum pressure — permanently maintained.

For taps, dead-ends, parallel connections, etc., in any location. Can be furnished in bronze or aluminum. Re-usable over and over.

With or
without
retainer.

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PENN-UNION ELECTRIC CORPORATION, Erie, Pa.

Canada: Dominion Cutout Company, Ltd., 250 Richmond St. West, Toronto



PENN-UNION

to you the lighting "missionary"

There's more to lighting than just fixtures and lamps . . . just metal, glass and wire. Selling or specifying better lighting is human welfare work: greater comfort for tired eyes—preservation of eyesight—better working conditions—more pleasant surroundings. It also means: no more torturing eyestrain—less fatigue—less nervous tension—better postures—a healthier disposition.

As a Lighting Man, you are fulfilling an important mission. You are contributing to a happier life for untold millions.

BE PROUD TO BE A LIGHTING MAN!

Copies of this ad suitable for framing—without our trademark—mailed free upon request on your letterhead.



It's not always the glamour—
it's the eye-comfort that counts

Guth LIGHTING

THE EDWIN F. GUTH COMPANY • ST. LOUIS 3, MO.

Leaders in Lighting since 1902

Modern Lighting

Ideas from a Frank Lloyd Wright House



ENTRANCE FOYER and hallway employ hi-hat exclusively, while incandescent bulbs in coves illuminate upper wall panels of living room. Powder room mirror reflects 14 1/4-inch square Plexiglas dome concealing 100-watt lamp.



BEDROOM CEILING hi-hats, like those of living room, are spaced on 4-foot centers at intersections of plywood sheets; two 48T12 fluorescent lamps concealed beneath book shelf provide reading light over head of bed.

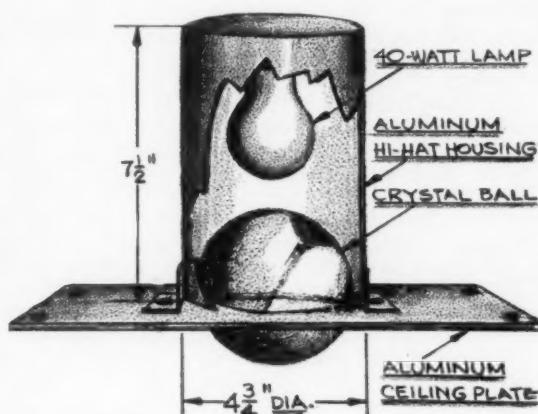
Custom-made built-in lighting fixtures were in keeping with the practical design of Frank Lloyd Wright's Usonian House, a model home recently exhibited at the Solomon R. Guggenheim Museum in New York City. With the exception of a limited number of floor and table lamps, all lighting was integrated in the building construction.

Very much in evidence was a simple incandescent hi-hat fixture fabricated by the General Lighting Company of Brooklyn. More than 60 of these easily-installed fixtures, providing a small, glare-free light source of low brightness, were recessed into the ceilings of the living room, bedrooms, foyer, hallway, and beneath the roof overhang of the outdoor patio.

Distinctive and effective ceiling lighting for the kitchen, bathroom, powder room and utility room was achieved by placing bare incandescent bulbs above circular or square-shaped Wascolite Skydomes (prefabricated metal-rimmed skylights of white translucent Plexiglas), resulting in perfectly-diffused white light.

Built-in fluorescent lamps provide local light for bedroom reading, bathroom mirrors and kitchen work areas.

Electrical contracting work was done by Charles Hyman of Brooklyn, N. Y.



CRYSTAL BALL provides combination lens and diffuser for custom hi-hat fixture used throughout the home. Hole through ball aids ventilation of unit housing, and by varying angle of hole away from the vertical, interesting decorative effects can be produced. Refraction of light through curved surfaces makes it impossible to distinguish shape of lamp bulb from below. Ball rests on aluminum ceiling plate, projecting down through circular hole slightly smaller than ball itself.



Marquee Lighting uses . . .

New Type Cold Cathode Lamps

A new type of cold cathode lamp was used to light the recently renovated marquee of the Mayan Room at Restaurant Mayan, Rockefeller Center, New York City.

The old marquee, which was lighted with incandescent units, was stripped down to the bare framework. Then baked white enamel reflector pans with mounted lampholders were installed on the interior ceiling of the marquee. Two rows of 35-mm cold cathode lamps for 240 ma operation, newly developed by Cold Cathode Lighting Corp of Long Island City, N. Y., were installed below the reflector pans. Each row contains 18 lamps, or 36 lamps total for the entire installation.

The bottom of the marquee is finished with 36 panels of Corning Albalite glass installed six inches below the lamps and flush with the bottom edge of the marquee. These panels are 27 inches by 28 inches, and are in four rows of eight panels per row, parallel to the front of the building. Overall dimension of the marquee is approximately 10 feet wide by 20 feet long.

The 35 mm cold cathode lamps are approximately eight feet long, and made in the form of a hairpin with the sides 6 inches on centers. The 36 lamps are operated from four 240-ma 6000-volt cold cathode Acme transformers, with nine lamps on each transformer.

One additional 240 ma 6000 volt transformer is used with two lines of 35-mm cold cathode lamps to light the letters in the vertical perimeter face of the marquee.

These new 35-mm cold cathode lamps, which are approximately 1.5 inches (T-12) in diameter, have all the long life characteristics of standard 25-mm cold cathode lamps, plus the additional advantage of lower surface brightness and higher lumen output, according to the manufacturer. They were specifically selected for this installation because of their suitability for outside cold temperature operation. They start well in cold weather and produce satisfactory footcandle levels. The intensity on the sidewalk was 38 footcandles, taken at an outdoor temperature of 32 degrees.

Architects for this marquee renovation were Carson and Lundin, and electrical contractor who installed the equipment was the Dobley Electric Company, both of New York City.

candles, provided by three 750-watt R52 reflector lamps suspended 21 feet above the floor in each 30-by-38-foot bay. Since the plant includes 3200 of these bays, it is apparent that the maintenance of lighting units comes in for serious consideration. And this consideration results in a vigorous nod of approval for the R52s, for the time required to clean and replace lamps in this present installation is only a fraction of that formerly required when each lighting unit consisted of a 400AH1 and three 150-watt general-line lamps. In addition to these main-



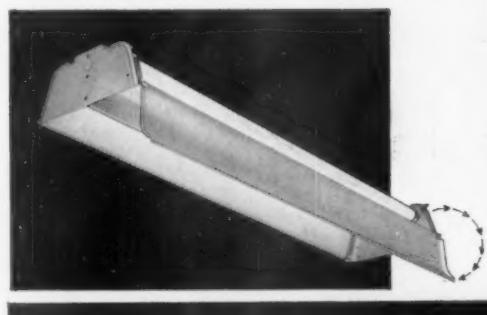
Maintenance Simplified By R52 Installation

The Ford Aircraft Engine Division in Chicago, Ill., has a general illumination level of approximately 30 foot-

NEW LAMPS FOR OLD resulted in the removal of large dirt-catching reflectors that formerly housed a 400AH1 and three 150-watt incandescent lamps each, and the substitution of a single 750-watt lamp having its own built-in reflecting surface.



Here's the Modern Way to Light a Factory ...Using Wakefield Industrial Pacemakers



The Industrial Pacemaker is a rugged steel luminaire with all major reflecting surfaces porcelain enameled. Note that the removable side panels unhook and hinge downward for easy, safe maintenance. ETL approved, brick type ballasts deliver full rated lamp watts. For pre-heat, Rapid Start or Slimline lamps.

Note the abundance of light. Note how uniformly it is distributed. Note especially the lighted ceiling area. Only a luminaire like the Wakefield Pacemaker will give these results, for the Pacemaker transmits 25% of the light up to the ceiling to be reflected in an over-all distribution pattern all over the room.

Now note again the lighted ceiling area. Not only is this the very key to modern plant lighting, but it has the added advantage of facilitating maintenance in the upper area. Listen to what one midwestern plant superintendent says: "In parts of our plant where we use reflectors which do not allow any light to go upward, the underside of the roof and the structure beneath is black and it is impossible to see piping or other structural parts for inspection or maintenance." Those black overhead caverns in plants are out-moded, inefficient and, thanks to the Pacemaker, unnecessary. For a folder on the Industrial Pacemaker, write to *The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada, Wakefield Lighting Limited, London, Ontario.*

Wakefield Over-ALL Lighting



WAKEFIELD GEOMETRICS



THE CAVALIER



THE GRENAIDER



THE PACEMAKER



THE COMMODORE



THE STAR



THE WAKEFIELD CEILING



the Best
in safety...
wearability

KLEIN-KORD

nylon
SAFETY
STRAPS



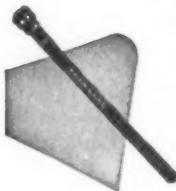
Count on being really satisfied with Klein-Kord **nylon** Safety Straps. They're smooth and flexible, require no special care—and give you that important extra margin of safety. Made of multiple plies of strong, finely woven **nylon**, bonded together with frictioning and vulcanized in neoprene. Red center is a safety signal to "Stop When You See Red!" Equipped with finest drop-forged hardware.

ASK YOUR SUPPLIER

Foreign Distributors:
International Standard
Electric Corp., New York

KLEIN Nylon
CLIMBER STRAPS

for calf and ankle
also available. Special straps furnished with rivets, burrs and punched for quick attachment to ring type climbers.

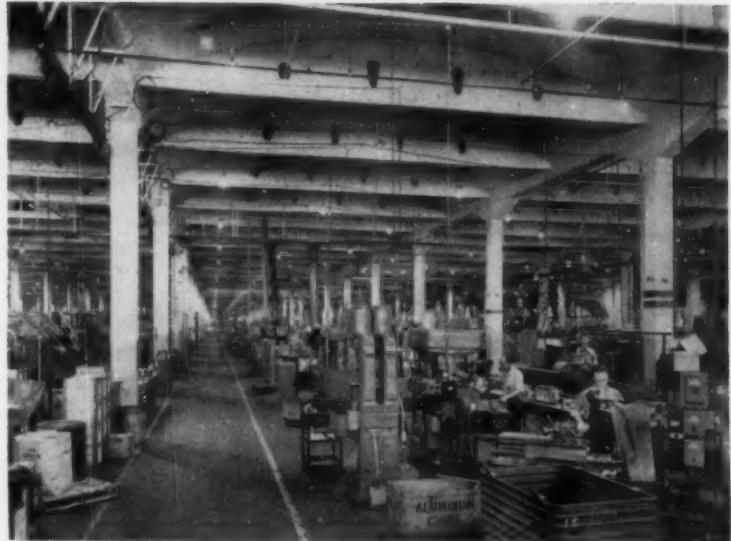


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"Since 1857"

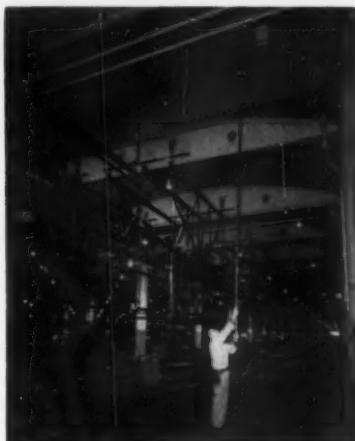


Mathias

KLEIN & Sons
Established 1857
3200 BELMONT AVE. CHICAGO 18, ILL.



ADEQUATE ILLUMINATION of 30 footcandles is obtained in Ford plant through installation of three 750-watt R52 lamps at 21-foot elevation in each 30-by-38-foot bay. Ceilings and columns are high-reflectivity ivory and light green.



CLEANING AND RELAMPING is now a one-man operation, for lamps can be removed or inserted by means of a twist-grip extension pole. This greatly simplifies maintenance routines. Another major advantage has been the doubling of the light output.

Tenace "plus" values, light levels also have been improved from their former range of around 15 or 16 fc.

Since adequate lighting is directly related to the efficiency, safety, accuracy and morale of an industrial plant, it is obvious that the former installation, in order to deliver its nominal light output, demanded the frequent cleaning of reflectors. Now, with reflectors incorporated in the lamps themselves, all that is required is to keep the lens of the lamp clean. This can readily be accomplished by a single man working at ground level, for he can remove and lower a lamp by means of a jointed extension twist-grip de-

vice, and then can insert a new or cleaned lamp in the elevated socket by the same process.

Replacement of units was a 2-man operation, with one man working from the top of a mobile crane and the other substituting "new lamps for old" from the floor.

Since each bay has an arched ceiling, fixture stems vary in length between 24 and 40 inches, with the resultant elevation of all units fixed at 21 feet. With the exception of the plant's black wood-block flooring, colors are high in reflectivity, adding materially to the efficiency of the overall lighting plan. Ceiling panels and upper surfaces of columns are ivory; lower columns are light green.

Chalkboard Lighting

On the premise that a specific lighting problem can best be solved by a specially designed lighting unit, the St. Paul of the Cross Elementary School, Park Ridge, Ill., has installed new chalkboard lighting units, which are in addition to the normal overhead or ceiling type luminaires. Using a single lamp fluorescent reflector trough equipped with an asymmetric type specular aluminum reflector, an average intensity of 50 footcandles is obtained over the entire surface of the standard chalkboards.

These new chalkboard lights, developed by Solar Light Manufacturing Co., Chicago, are designed so that the single row of fluorescent lamps are shielded to 60 degrees from the chalkboard side, thus eliminating any bright-

ART METAL DRUMS

LENSDRUM

Prismatic glass—clear glass bottom
200 to 300 watts

TAPERDRUM

Opal glass—
100 to 300 watts

VEEDRUM

Opal glass—
100 to 400 watts

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THE **ART METAL** COMPANY
CLEVELAND 3, OHIO

Manufacturers of Engineered Incandescent Lighting

SAFE!

- Approved by Underwriters' Laboratories, Inc.
- Tested for higher fixture wattage ratings.
- Connection to any standard building wire.

SAVE!

- Time saving installation.
- Time economizing maintenance.
- Time tested construction.



**Controlled quality
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Ecor FITTINGS
best!**

All EFCOR Electrical Fittings undergo a series of rigorous gauging tests to insure trouble-free performance under all conditions.

EFCOR manufactures a complete line of quality fittings, made of malleable iron or steel, for every type of installation.



CONTINUOUS REFLECTORS light chalkboards in the St. Paul of the Cross Elementary School, Park Ridge, Ill., to average of 50 footcandles. Specially designed Solar Light Mfg. Co. asymmetric aluminum reflectors direct all light from single row fluorescent lamps to boards, shield lamps from classroom side.

ness annoyance to the students in the room, or even to a student standing close to the chalkboard. They may be installed above new or existing chalkboards and, as is demonstrated in the Park Ridge School, illuminate the boards evenly from top to bottom without causing glare.

Because the light source is continuous, there is no shadow of the hand as one writes on the board. Also, because the reflector is located close to the board, and all the light from the lamps are directed scientifically and efficiently to the board's surface, it is possible to obtain a high intensity of illumination on this surface at a low cost in wattage consumed. Because of the low reflectance of these boards, it has been found desirable in the Park Ridge School to light them to a much higher intensity than the adjoining wall surfaces on which the boards are installed. In this way the visual environment of the rooms is improved.

This system of localized chalkboard lighting minimizes the problem of blindspots on the board caused by reflected natural light.

Dual Switching Provides 30-60-90 FC Selection

When Harold F. Steinbrecher, Civil Engineer of Wheaton, Illinois, lighted his up-to-the-minute office, top priority went to high quality planned lighting. Typical of the entire installation is this private office where 3-level illumination permits selection of the most comfortable lighting for casual conversation, normal business paper work or drafting. The relatively small office (10-by-11½-feet) has an 8½-foot suspended ceiling consisting of alternate panels of white acoustical tile and

translucent corrugated Marluz plastic panels. Mounted 9 inches above each luminous section are three parallel 2-lamp 8-foot fluorescent units operating on 200-milliamp ballasts and so switched that the two center units, the four outer units, or all six 2-lamp units may be operated as desired to provide illumination levels of approximately 30-, 60- or 90-footcandles.

With natural light brown wall paneling, green carpeting and draperies combining various shades of green with white; plus the light and sound conditioning mentioned, this office is conducive to productive concentration.

Design was by Fisher, lighting consultant for the Public Service Company of Northern Illinois at Downers Grove; installation was made by Frazer, electrical contractor of West Chicago; architecture was by Salisbury of Wheaton.



PRIVATE OFFICE is illuminated by two luminous panels, each back-lighted by three 2-lamp fluorescent units which may be switched in groupings to provide 30-, 60- or 90-footcandles to desk or drafting table surfaces.



1ST FLOOR



2ND FLOOR

New Look FOR AN OLD BUILDING

...with Lighting by **LITECONTROL**

This superb remodeling job (in a forty-year-old building) needed custom lighting to show it at its best and provide plenty of balanced light for office work. One versatile fixture—LITECONTROL 4044—does the job perfectly, lights it just the way everyone wants it.

It's well-illuminated (84 footcandles on the second floor), but even and glare-free. And it's economical on every count.

LITECONTROL 4044 is a louvered fixture that can be used in many ways. Here, it's surface mounted on the first floor, mounted on pendants on the second. It can be hung in rows or individually, as over the door. It goes up easily, is easy to clean and relamp. Louvers swing fully open from either side from spring catches.

LITECONTROL versatility means *custom lighting* with standard fixtures. That means *standard prices*. There are twenty-seven basic fixtures that can be combined or modified to light your job the way you want. For lighting or relighting, call your LITECONTROL representative.

INSTALLATION: Time Credit Office, Union Market National Bank, Watertown, Mass.

ARCHITECT: J. Williams Beal Sons, Boston, Mass.

ENGINEER: Lionel G. Gale, Boston, Mass.

DECORATOR: John H. Pray & Sons Co., Boston, Mass.

ELEC. CONTRACTOR: Hawes Electric Co., Watertown, Mass.

FIXTURES: No. 4044 4-lamp 40-watt Bipin-louvered, 35°-25° shielding. Surface mounted (1st Floor). On 4" stems (2nd Floor)

CEILING HEIGHT: 11'-0" (1st Floor) — 10'-2" (2nd Floor)

SPACING: 8'-0" on Centers

INTENSITY: 70 Footcandles average in service (1st Floor), 84 Footcandles average in service (2nd Floor)



LITECONTROL *Fixtures*

LITECONTROL CORPORATION

36 PLEASANT STREET, WATERTOWN 72, MASSACHUSETTS

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS



There's Profit in G-E Remote-Control Wiring

"You're in a growing market when you learn how to handle G-E low-voltage remote-control wiring jobs," says C. L. Rice, president, Twin City Electric Company, Kansas City. "You can give your customers many more switches for little more than the cost of a conventionally wired house. Buyers seem to like the extras that G-E remote-control offers—so I am all for it as a way to build business."

Not difficult to install

"G-E remote-control wiring is not difficult to install," Mr. Rice continued. "We got the contract for the 1750 house Ruskin Heights project here in Kansas City. Our price for these \$10,000 and \$10,500 houses was about \$30 more per house than a conventional wiring system. As my men became familiar with remote-control wiring, they made real speed. The lightweight control wire is easy to handle. This makes the work go fast and helps keep the costs down to a reasonable figure. G.E. has a fine booklet for contractors that is a big help for figuring and installing your first remote-control job."

Helped builder sell 500 homes in one month

"One month after announcing that our \$10,000 and \$10,500 homes were open for inspection, we had orders to build more than 500," says W. W. Praver, president, Praver & Sons, developer of Ruskin Heights. "I am convinced that the G-E remote-control wiring system was an important factor in this record sales volume."



NEW . . . Circuit Servant master switch makes possible control of as many as 25 separate circuits from as many locations as desired. Can be wired to turn any preselected pattern of lights and outlets ON and OFF. Economical master control for home, farm, institutional, and commercial installations.

See your G-E Construction Materials distributor or write Section D68A-318, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.



You can put your confidence in—
GENERAL  **ELECTRIC**

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• CATALOGS, BULLETINS AND ENGINEERING DATA:

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caused a four-way bearing seal. There are two seals on each side of bearing—an inner seal and outer seal. The frames are of cast iron. All finishes are corrosion resistant. In conforming to the new NEMA standards for dimensions of motors from 1 to 30 hp, motors are smaller per hp.

Westinghouse Electric Corp., Pittsburgh 30, Pa.

Electric Brakes

(2)

Replaceable face electric brakes and stationary field electric clutches smaller than a man's hand are recommended for fast, accurate control of low-torque drives. High-speed engagement and release, coupled with high torques, make the units adaptable for starting, stopping, indexing, rapid cycling, synchronizing,

peres on 230 volt motors. Magnet coils are available for continuous duty ratings up to 480 volts, 60 cycles or 300 volts, 25 cycles.

Square D Company, 4041 North Richards St., Milwaukee, Wis.

Electric Heaters

(4)

Electric heaters for 5-gallon drums are constructed of alloy resistance wire covered with glass and silicone insulation and tough nylon outer braid. Heat-up speed may be increased by wrapping blanket of fibrous glass around heater and drum. Unit is rated at 300 watts, plugs into a 115-volt circuit, is wrapped around drum and held secure with snap fasteners, thereby applying uniform heat at all points on the drum surface.

Pre-Fab Heater Co., Guilford, Conn.

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Threading Machine

(6)

No. 142 "Featherweight Champ" is a new power drive for hand pipe tools. It weighs 75 lbs and one man can move it and use it with ease. Available with either gas or electric power, it has a threading range of $\frac{1}{2}$ -in. to 2-in. Dimensions less legs are: height 18 $\frac{1}{2}$ -in., width 15-in., length 11 $\frac{1}{2}$ -in. Motor is $\frac{1}{2}$ hp continuous duty universal, reversible, variable speed. Booklet is available.

Oster Manufacturing Co., 2057 East 61st Place, Cleveland 3, Ohio.

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The Editor
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330 West 42nd St.,
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NEW . . . Circuit Servant master switch makes possible control of as many as 25 separate circuits from as many locations as desired. Can be wired to turn any preselected pattern of lights and outlets ON and OFF. Economical master control for home, farm, institutional, and commercial installations.

See your G-E Construction Materials distributor or write Section D68A-318, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

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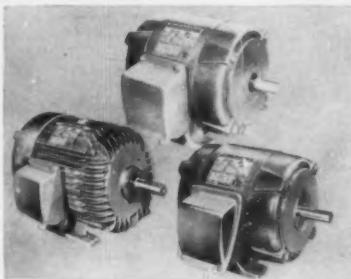
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Product News



Induction Motors (1)

A new induction motor—the Life Line A—designed to offer users longer motor life, greater flexibility in application, and higher reliability as well as decreased size. It has improved ventilation, better insulation, a more efficient and better protected bearing, and in addition is quieter and smaller per horsepower, conforming to the new NEMA standard dimensions. It is available in three enclosures: totally-enclosed fan cooled, totally-enclosed non-ventilated, and drip-proof. Wire, coil, dip, and cable insulations are all new. The Bondar wire insulation is a synthetic resin. Coil insulation is a combination of Mylar polyester film and rag paper. The Bondite dip insulation is a phenolicalkyd thermosetting-type varnish with silicone incorporated into it. The cable insulation, a lacquered glass braid covering, has an operating temperature of 75°C.

The ventilation system on the drip-proof motor has been improved and is now suitable for both indoor and outdoor use and for all applications where a totally-enclosed motor is not required. Ventilation system is a straight through design with the ventilation openings located in one quadrant of the rim of the end bracket. This location protects the motor from overhead drippings, no matter if motor is floor, wall, or ceiling mounted.

The Life Line-A motor has what is called a four-way bearing seal. There are two seals on each side of bearing—an inner seal and outer seal. The frames are of cast iron. All finishes are corrosion resistant. In conforming to the new NEMA standards for dimensions of motors from 1 to 30 hp, motors are smaller per hp.

Westinghouse Electric Corp., Pittsburgh 30, Pa.

Electric Brakes (2)

Replaceable face electric brakes and stationary field electric clutches smaller than a man's hand are recommended for fast, accurate control of low-torque drives. High-speed engagement and release, coupled with high torques, make the units adaptable for starting, stopping, indexing, rapid cycling, synchronizing,

torque limiting, jogging and single revolution cycling applications on small, electrically operated instruments and machinery. Pushbutton or automatic operation with limit switches, relays, electric eyes and other electric controls give wide design possibilities. Voltage adjusted by means of rheostats, giving wide selection of acceleration and deceleration rates. Torque ratings are from 8- to 240-in. lbs.

Warner Electric Brake and Clutch Co., Beloit, Wis.



Magnetic Relay (3)

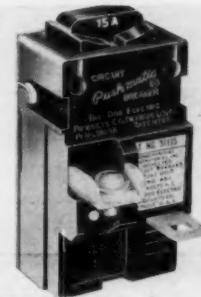
This new magnetic relay is designed for use with single phase capacitor start motors requiring a voltage-sensitive relay to disconnect the start winding or reduce the capacitance when motor approaches full speed. Assembled on a molded phenolic base, the device measures 2 1/2-in. high, 1 1/2-in. wide, and 2 1/2-in. deep. The clapper-type magnet is designed with a permanent air gap, a knife-edge bearing, ground sealing surfaces and a heavy shading coil. Double break, silver-to-silver contacts on single pole, normally-closed relay are capable of handling start winding currents up to 50 amperes on 115 volt motors and 35 amperes on 230 volt motors. Magnet coils are available for continuous duty ratings up to 480 volts, 60 cycles or 300 volts, 25 cycles.

Square D Company, 4041 North Richards St., Milwaukee, Wis.

Electric Heaters (4)

Electric heaters for 5-gallon drums are constructed of alloy resistance wire covered with glass and silicone insulation and tough nylon outer braid. Heat-up speed may be increased by wrapping blanket of fibrous glass around heater and drum. Unit is rated at 300 watts, plugs into a 115-volt circuit, is wrapped around drum and held secure with snap fasteners, thereby applying uniform heat at all points on the drum surface.

Pre-Fab Heater Co., Guilford, Conn.



Circuit Breaker (5)

The Duo Guard Pushmatic has been made the standard circuit breaker for the Electri-Center panelboard line. It has separate thermal and magnetic elements, giving double protection. The protective mechanism consists of two elements, a bimetal strip and a multiple-turn solenoid. The thermal element (bimetal strip) protects branch circuit wiring and insulation, from Electri-Center panelboard to receptacle or outlet, from any kind of thermal overloads. The magnetic element (multiple-turn solenoid) provides instantaneous protection for lamp and appliance cords, from receptacles or outlets to all properly connected electrical equipment. It also protects branch circuit wiring. Pushmatics are available in 15, 20, 30, 40 and 50 ampere ratings, 1 pole, 120 volt, ac. They are listed by Underwriters' Laboratories, Inc.

BullDog Electric Products Company, Detroit 32, Mich.



Threading Machine (6)

No. 142 "Featherweight Champ" is a new power drive for hand pipe tools. It weighs 75 lbs and one man can move it and use it with ease. Available with either gas or electric power, it has a threading range of 1/4-in. to 2-in. Dimensions less legs are: height 18 1/2-in., width 15-in., length 11 1/2-in. Motor is 1/2 hp continuous duty universal, reversible, variable speed. Booklet is available.

Oster Manufacturing Co., 2057 East 61st Place, Cleveland 3, Ohio.

midwest

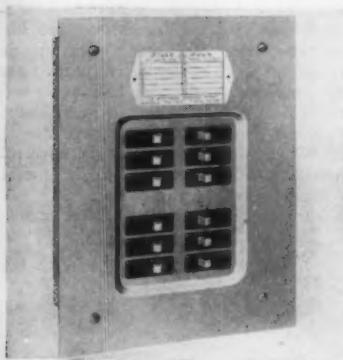


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Midwest Electric Mfg. Company

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

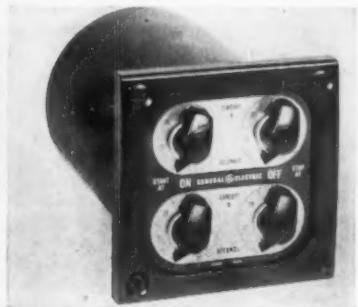
1639 W. WALNUT STREET
Chicago 12, Illinois



Circuit Breaker (7)

FM thermal-magnetic trip circuit breaker load center and service equipment for use in homes, offices and other commercial buildings, schools, hospitals and other institutions where automatic circuit protection is desired. Approved by Underwriters Laboratories for label service, the units are of the "panel base assembly" type. A feature is the T-M thermal-magnetic trip circuit breaker with quick-make and quick-break operation on manual or automatic trip and magnetic blow-out. The thermal-magnetic action automatically trips the handle, indicating the circuit in trouble. On short circuits and dangerous overloads, the magnetic trip hastens the action of circuit breaker. Units are available in four basic combinations to afford a maximum of 4, 8, 12 and 20 poles (all single pole, or combination of single and double-pole). Available in the following capacities: 10, 15, 20 and 30 amps, 120 volts ac single pole and/or 120/208 volts ac double pole individual trips; 40 and 50 amp, capacity furnished with QP Quicklag P circuit breaker; main lugs for 100 amp, maximum 115/230 volts, 3-wire single phase or 120/208 volts, 4-wire three phase mains.

Frank Adam Electric Co., P. O. Box 357, St. Louis 3, Mo.

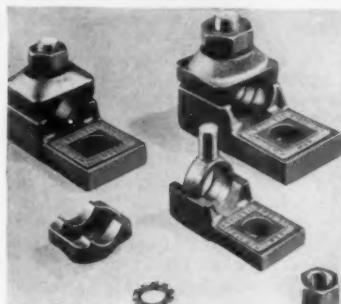


Timers (8)

A new line of process timers for providing accurate, adjustable time-delay opening and closing of electric contacts. Designated Type THA-18, the timers can control such process equipment as hydraulic presses, tire molds, carpet dryers, baking equipment, heat-treating ovens, sirens, mixing machines, signals, conveyors, photographic equipment, and others. Features of the redesigned equip-

ment include extra heavy nylon gears, over-all construction of almost 100% pure zinc alloys, and a dust-resistant cover. New semi-flush mounting on face of timers reduces size. Timers are available in single-circuit or two-circuit models. All timers are equipped with a bevel for semi-flush mounting. They operate on a power supply of 60, 50 or 25 cycles, with a contact rating of 10 amps at 120 volts or 5 amps at 240 volts.

General Electric Co., Schenectady 5, N. Y.



Lugs (9)

New design of DuraLug is made in 11 cable range sizes. Made of high-conductivity and high-strength bronze, units are simple in design and ruggedly constructed. Lugs withstand ASTM and ABW mercurous nitrate specifications, guaranteeing resistance to stress, corrosion and seasonal cracking. Recommended for use in corrosive and contaminated atmospheres.

Anderson Brass Works, Inc., Birmingham, Ala.



Floodlight (11)

A new 20-inch floodlight, designated Type 20175, is designed to burn 1000-watt G-40, 1500-watt G-48, and 1500-watt PS-52 lamps which have special burning positions recommended by lamp manufacturers. It will also take the 750 and 1000-watt PS-52 lamps and 700 and 1000-watt mercury vapor lamps. Unit is fully enclosed and constructed of corrosion proof material. Door and glass joints have a tight, soft packing seal which keeps moisture and dirt from reflector. The full 360 degree vertical and horizontal body adjustments are provided with a locking device to avoid any accidental movement.

Pyle-National Company, 1344 North Kostner Ave., Chicago 51, Ill.



Circuit Breaker (12)

With a new design in 1-, 2-, and 3-pole construction, the 100-ampere "E" frame circuit breaker can be used in panelboards, switchboards, load centers, and all types of individual enclosures. The "E" frame is a circuit breaker with quick-make, quick-break contact action. Thermal-magnetic tripping gives protection against overloads and short circuits. On manual or automatic operation, common trip feature opens all contacts simultaneously whenever an overcurrent on any one pole occurs. "Trip-free" handle mechanism prevents breaker from being closed against faults. Three-position handle indicates on, off, and tripped positions. It is approved by Underwriters Laboratories, Inc. Available in ratings from 15 to 100 amperes; 1-pole, 125 volt ac, dc; 2-and 3-pole, 250 volts ac, 125/250 volts dc; 5,000 amperes interrupting.

I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia 30, Pa.

INCREASE HEATING EFFICIENCY
LOWER HEATING COSTS

with

CHROMALOX
Electric HEATERS



• EASY TO INSTALL
• ECONOMICAL TO USE

Want the quick, low cost answer to almost any heating problem in your plant? Get it with Chromalox Electric Heaters! Over 15,000 types and sizes for heating dies, molds, platens; for preheating oil and super-heating steam; for heating asphalt, greases, oils; for drying, curing, baking, dehydrating and other heating jobs. See how Chromalox Electric Heat can help cut your costs!



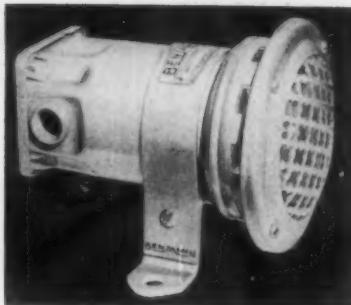
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THE BEST IN ELECTRIC HEAT

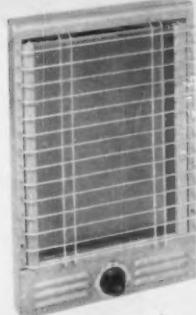


Siren

(13)

This new design is primarily designed for fire and air-raid signalling; however, it is also recommended for installation in elevator shafts, factory production areas, etc. Motor which drives siren is rated at 1/5 hp at 10,000 rpm. Motor parts are assembled in a precision-machined cast-iron housing, which, in turn, is assembled in a sheet steel casing. A rubber washer is placed between castings to prevent moisture from entering. A 1/2-in. iron-pipe threaded bushing is furnished for 1/2-in. conduit. Ten rectangular openings or ports, in steel casing permit expulsion of air. A grill-guard is fastened to front of case.

Benjamin Electric Mfg. Co., Des Plaines, Ill.



Heating Panel

(15)

The "Select-a-Temp Junior" electric radiant-heating glass panel is designed for small rooms such as bathroom, laundry, dressing room, etc. Heating element is a uniform coating covering entire radiating surface. Unit is of tempered Pyrex brand glass with spring loaded carbon contacts mounted on brass bus bars to make electrical contact with silver terminating edges of conductive coating. Panel has a built-in thermostat and is rated at 750 watts or 2560 Btu. Available in two styles with guard, for 115 and 230 volts. It is 21 1/2 in. high by 14 1/2 in. wide by 2 1/2 in. deep and mounts flush against wall.

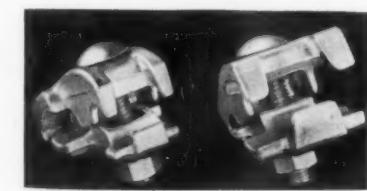
Berko Electric Mfg. Corp., 212-40 Jamaica Ave., Queens Village, N. Y.



Circuit Breaker

(14)

A new Stab-lok circuit breaker device, AB-192, is designed particularly for applications where a large double-oven range of high kilowatt consumption requires main circuit breakers greater than 50 amperes or where large single phase compressors are being used for air-conditioning. It features a sequence bussed branch panel making it possible to use ten single pole or five double pole branch circuit breakers, controlled by one 50 amp main breaker. Four additional 50 amp main breakers may be used for major



Connectors

(16)

Parallel connectors, Types LC-51C and LC-81A, recommended for A.C.S.R., aluminum and Amerductor have been especially designed and engineered to provide maximum contact surface in cable grooves. Interlocking fingers on both top and bottom members are designed to completely enclose both main and tap. This containment of cables insures minimum distortion under pressure, and prevents both connector and cable deterioration. Long, "fumble-proof" bolts exert straight pressure without distortion regardless of cable size combinations.

Anderson Brass Works, Inc., Birmingham, Ala.

Here are your answers to 2 IMPORTANT QUESTIONS about Industrial Lighting Units



1 WHY are RLM Specifications Important to me?

ANSWER: RLM Specifications furnish you with basic, nationally-accepted minimum standards of

efficiency, design, performance and quality in industrial lighting equipment. This latest-edition 52-page RLM Specifications Book puts all 21 RLM Specifications at your fingertips, complete with coefficient of utilization tables and candle-power distribution curves. In addition, there are four pages of reasons why RLM Specifications are important to everyone who buys, sells or specifies industrial lighting equipment. Send for your COMPLIMENTARY COPY of the RLM Specifications Book...there is no obligation!

2 WHO makes RLM-Labeled Units I want to Specify?

ANSWER: As shown by this chart, which is also included with the RLM Specifications Book, there are 29

different manufacturers who make RLM-labeled lighting equipment. Each RLM Unit must conform to the minimum performance and quality standards required by RLM Specifications. However, every manufacturer is free to incorporate his own special features, construction refinements and operating advancements — such as sockets, control equipment, wiring, etc. Send for your FREE RLM Book for more details. RLM Standards Institute, Suite 819, 326 West Madison Street, Chicago 6, Illinois.

Actually, there are 75 different types and sizes of RLM-labeled Lighting Units. Each red dot on this chart indicates that the manufacturer makes at least 1 or more sizes covered by the particular RLM Specification.

Key to Spec. Nos.:

INCANDESCENT UNITS:

1. Dome (100-1000w)
2. Deep Bowl (100-1000w)
3. Sym. Angle (100-1000w)
4. High Bay (500, 1000w)
Porcelain Enameled
18. Glasssteel Diffuser
(200-1000w)
40. High Bay Aluminum
(500, 1000w)

FLUORESCENT UNITS:

Closed-End Reflectors:

5. 2-40w lamps, 48"
6. 3-40w lamps, 48"
7. 2-85w lamps, 60"
22. 2-40w w/shield, 48"

Open-End Reflectors:

9. 2-40w lamps, 48"
10. 3-40w lamps, 48"
11. 2-85w lamps, 60"
23. 2-40w w/shield, 48"
28. 2-58w, 72"
29. 3-58w, 72"
30. 2-75w, 96"
31. 3-75w, 96"

Semi-Direct Units:

35. 2-40w, 48"
36. 2-58w, 72"
37. 2-75w, 96"

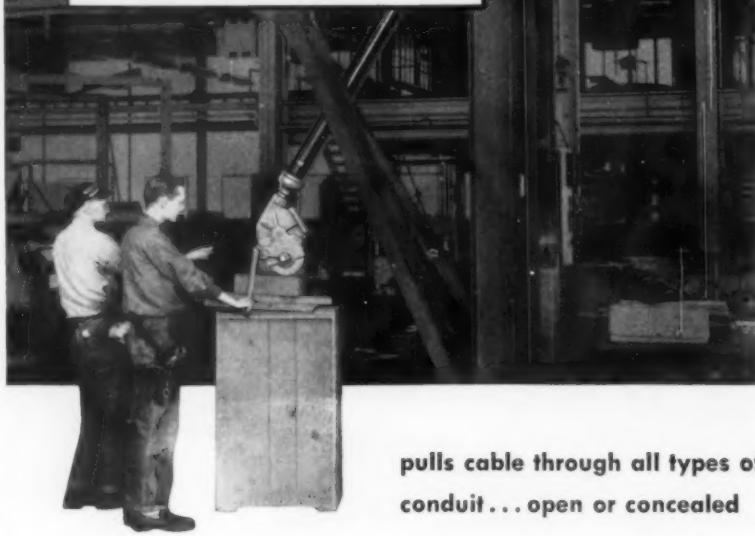
Chart as of Jan. 1, 1954

RLM STANDARDS INSTITUTE
INCORPORATED

The letters RLM stand for Reflector and Lighting Equipment Manufacturers



GREENLEE CABLE PULLER speeds and simplifies wiring installations



Here's an on-the-job view of a standard GREENLEE Cable Puller with a flexible elbow attachment making simple work of what could have been a mighty tough job.

In about five minutes, three 1,000,000-circular-mil cables were pulled through an 80-foot length of 4-inch conduit which is some 18 feet above the floor level. Setup time included, the entire job took approximately an hour and was handled simply, easily.

Whether you have high overhead jobs like this calling for the use of the attachment, or more routine work, you'll find the GREENLEE Cable Puller a big timesaver that helps get the job done faster, at lower cost. With it you *pull in line with the conduit*. When used without attachments for concealed conduit work, it clamps directly on the conduit. You get a fast, easy pull

OTHER GREENLEE TIMESAVING TOOLS FOR ELECTRICAL WORK
Hydraulic Conduit Benders • Tubing Benders • Auger Bits and Drills • Knockout Punches • And many more



Switch

(17)

A manual starting and overload switch for fractional horsepower motors was developed for use on washing machines, clothes dryers, lawn mowers, and similar applications. It is totally enclosed. Protection against overload is provided during both starting and running through the use of a nichrome heater and a nickel-alloy bimetal strip in the tripping mechanism. Measuring 2 1/8-in. long, 1 1/8-in. wide, and 1 1/8-in. high, the control has two mounting holes to accommodate No. 6 self-tapping screws.

General Electric Co., Schenectady 5, N. Y.

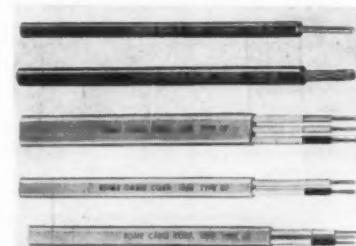


Air Conditioners

(18)

Two new air conditioners for room use have UL approval and include GE heating units, Ranco thermostats, permanently lubricated motors, spring mounted compressors, control switches, directional louvers, steel and plastic cabinets. Units are rated for 1/2- and 1-ton, will circulate 300- and 340-cfm respectively, will remove 30- to 36-qts of moisture from the air every 24 hours, and are recommended for rooms with floor areas up to 400- and 550-sq. ft.

Noma Lites, Inc., 55 W 13th St., New York 11, N. Y.



Multi-Purpose Cable

(19)

New low-cost versatile cable for branch and feeder circuits on farms, in industry and homes. Named FlexAll, it is designed especially for underground feeder



(17)

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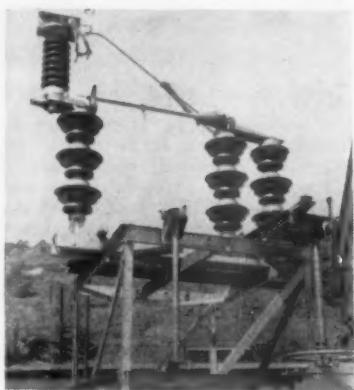
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service, plus locations where dampness or corrosive action is encountered. Available in 1-, 2- and 3-conductor construction, it is approved by Underwriters' Lab and recognized by the 1953 NEC. Single conductor is approved Type UF (underground feeder), while 2- and 3-conductor cable is approved as both UF and NMC (non-metallic sheathed—corrosive resistant). Suitable for direct earth burial when provided with suitable over-current protection. In addition, multiple conductors are suitable for interior wiring either exposed or concealed, in wet or corrosive locations, in hollow spaces of masonry block or tile walls, embedded in plaster or shallow chase of chimney when suitably protected. Bulletin RF-1 available.

Rome Cable Corp., Rome, N. Y.



Interrupter Switch (20)

A new load interrupter switch (Type VLB) for line sectionalizing and load switching is available. It will interrupt transformer magnetizing currents, line charging currents, and load currents up to the continuous rating of switch. It consists of a standard disconnecting switch (Type V) to which is added gas-filled load-interrupting device. The gas-filled interrupter is a parallel-connected unit which carries current only during interrupting interval. It is porcelain-clad, gas-sealed, and requires no external supply of gas or other auxiliary apparatus for operation. Switch is available in voltages from 7.5 to 115 kv, with a continuous current rating of 400 and 600 amperes.

Westinghouse Electric Corp., Pittsburgh 30, Pa.

Rectifier (21)

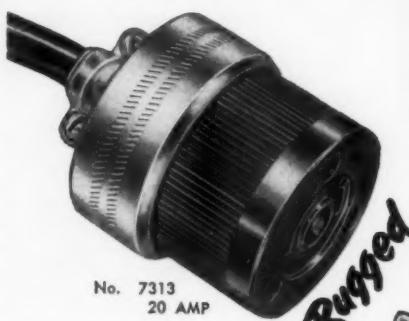
A new 3-phase selenium rectifier that limits short circuit current. The Robin-Arc X-100 rectifier delivers continuously 100 amp, 62 volts from inputs of 185-250 volts, 3-phase, 50/60 cycle, and is adjustable from 36 volts up to 62 volts in small increments. Standard units up to 180 amps at 80 volts with identical characteristics are now available.

J. E. Robin, Inc., 205 Rhode Island Ave., East Orange, N. J.



HUBBELL Twist-Lock^{TRADE-MARK}

3 and 4-wire
ELECTRICAL
CONNECTORS



No. 7313
20 AMP

Rugged



No. 7311
20 AMP

Wherever motor driven tools or portable electrical apparatus are used, Hubbell Twist-Lock is recommended for 2, 3 or 4-wire systems . . . for increasing electrical capacity . . . safety . . . modernization, or for grounded protection.

Ask Your
Distributor

*Highest
Grade*
HEAVY DUTY

WIRING DEVICES



Twist-Lock 3 and 4-wire sizes are available grounded or not grounded.

HARVEY HUBBELL, Inc.
DEPT. C-1
BRIDGEPORT, CONNECTICUT



**More and more
mechanics
say...**

**Our Pipe
Wrench Replacements
in '54 are being
made with
the NEW
TOLEDO**

**TOLEDO
Heavy-Duty
Pipe Wrench**

**★ Unconditionally
Guaranteed!**

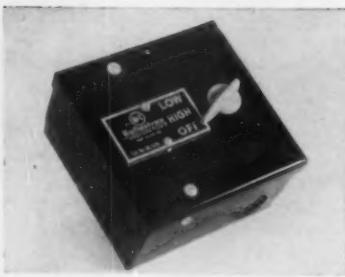
Just introduced — and making friends fast! See 'em—try 'em on your next job!

New Toledo Wrenches speed the work with easy handling . . . instant non-slip grip on pipe . . . replaceable jaws with spin-easy nut and single spring for quicker, easier setting . . . improved handle design for increased strength, better hand-grip. 6" to 48" sizes.

Unconditionally Guaranteed! If wrench housing or hook ever breaks or distorts, we will replace it Free. Write for new catalog. Order through your supply house. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

Rely on the Leader . . . all the way!

TOLEDO
PIPE TOOLS • POWER PIPE MACHINES
• POWER DRIVES



Control

uses fixed, expansion or adjustable reamers and covers all popular shaft sizes from $\frac{1}{2}$ -inch to $1\frac{1}{8}$ -inch. Oversized and undersized reamers also furnished for each fractional size. All reamers have $\frac{1}{2}$ -inch shank, meeting requirements of practically all popular sizes of fractional and small integral-hp motors.

Potter & Rayfield, P.O. Box 1042, Atlanta, Ga.



Traffic Separator Light (25)

A new weather-proof, vapor-tight, traffic separator light designed for flush mounting in the raised horizontal surfaces of curbs, safety islands and walks. An inside frosted lamp, an Alzak parabolic reflector, and a $5\frac{1}{2}$ -in. stepped lens provide a flush fixture with a beam which can be seen clearly by motorist from a distance and still not have an objectionable glare at close range. The lens and clamp ring are gasketed to make a vapor-tight seal, and are easily removed for relamping. Porcelain lamp receptacle is a medium screw base type with wire terminals accessible through lens opening. VSL lights are available with or without Alzak reflector, for 15 or 25 watt lamp sizes tapped for $\frac{1}{2}$ -in. or $\frac{3}{4}$ -in. conduit.

Pyle-National Company, 1334 N. Kostner Ave., Chicago 51, Ill.



Enclosure (23)

Lead-plated, sheet-steel enclosures for safety switches and circuit breakers. They are designed for outdoor use and other special applications where cast-iron enclosures were previously used. Enclosures will find wide applications where humid, dust-laden and corrosive atmospheres prevail, such as those characteristic of steel, paper and cement mills, dairies, breweries and chemical plants.

Trumbull Components Department, General Electric Co., Plainville, Conn.

Reamers

Set of 33 special reamers designed to speed and simplify reaming of end bell bearings. Reams at true right angles with critical surface of bell. Reamer drive



Socket

A newly-designed rubber pigtail socket of the weatherproof variety features a higher rating increase. Listed as Cat. No. 132, it is both UL-approved and CSA-approved and has a rating of 660 watts, 600 volts, representing an increase of more than double the rating of the previous No. 132 which was listed at 660 watts, 250 volts. It features water-tight sealing boots wired with $6\frac{1}{2}$ -in. of No. 14 Type R wire, black and white striped. Water-tight lead entrance extends $\frac{1}{2}$ -in. deep to form a seal around the wire. Soldered eyelets assures electrical connection of leads to screw shell.

Rodale Mfg. Co., Inc., Emmaus, Pa.

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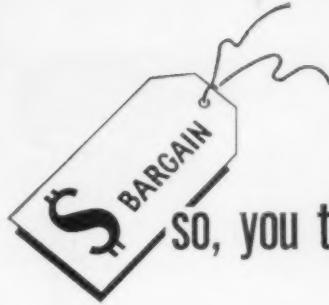
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So, you think you're saving your customer's money?

Far too often people figure lighting fixtures are all alike and buy and sell by price tag alone. You may save your customers a dollar or two on the price of each unit, but are you really saving their money?

Today's carefully engineered lighting installations are planned with units that are designed to deliver more light at less cost. *Fewer units are required to secure the same results.* So, installation costs are less. And most important, power and maintenance costs are less during the whole life of the installation.

Take the Smithcraft DIRECTOR, for example. A recent comparison test by one of the nation's leading electric utilities clearly demonstrates that the Director produces more light and better light per dollar spent than ordinary fixtures.

Installed in literally thousands of banks, stores, schools and similar locations across the United States, the Smithcraft Director is in a class by itself for appearance, for quality of lighting and for soundness of investment. Be sure you have the complete story on the Smithcraft DIRECTOR when planning lighting installations. Ask us to send you our Smithcraft Director folder.

Photograph shows Director installation in the offices of the Credit Representative of the First National Bank of Boston, Empire State Building, New York.

BUY LIGHTING — NOT FIXTURES. **INVEST** IN AMERICA'S FINEST FLUORESCENT LIGHTING by

Smithcraft
LIGHTING DIVISION
CHELSEA 50, MASSACHUSETTS

NEW! Ramset

FASTENING SYSTEM

SUPER-POWER JOBMASTER

takes over
where others
leave off

NEW FEATURES for Performance Economy Utility

Shortest, lightest, heavy-duty tool

Greatest driving power

**New series of power-sealed
charges balanced to the tool**

**Circle-Set Shield, adjustable for
12 positions of handle**

Faster, easier operation

All the family characteristics of RAMSET JOBMASTER and PLUS-POWER JOBMASTER are built into the new SUPER-POWER JOBMASTER for heavy-duty fastening into steel up to 1" thick or into hardest concrete. Ask your dealer to demonstrate the many new features which make SUPER-POWER JOBMASTER the outstanding powder-actuated tool for speed, ease, utility and economy, and to show you how it takes over where all others leave off. Or, write us for details.

Ramset Fasteners Inc.
12105 BEREA ROAD • CLEVELAND 11, OHIO

FIRST IN POWDER ACTUATED FASTENING

Ramset Division,
Olin Industries, Inc.



Soldering Guns

(27)

New heavy-duty model D-550 soldering gun is designed to handle a wide range of industrial soldering jobs. An exclusive tip fastening arrangement assures constant heat by eliminating contact resistance and oxidation. The dual heat feature affords extra capacity where high heat is required, and provides an increase in tip life. The pistol-grip has now been centered under the housing for better balance. All models are equipped with dual spotlights for soldering in dark corners. Two new industrial models are available; the single heat 250-watt, or the dual-heat 200-275-watt model.

*Weller Electric Corp., 808 Packer St.,
Easton, Pa.*



Signal Arrester

(28)

A new valve type signal arrester that provides lighting protection for ac circuits of 0-175 volts or dc circuits of 0-30 volts. Designated Type L, it furnishes consistent sparkover, high discharge capacity, and low IR drop. Designed primarily for protecting railway signal systems, it meets requirements of the Association of American Railroads. It may be applied to other low voltage systems, such as fire alarm circuits, remote metering circuits, airport lighting circuits, and relay circuits. Unit consists of a spark gap and valve element in a clear plastic housing, all mounted on a Bakelite base. Arrester has a positive moisture-proof seal.

Line Material Company, 700 W. Michigan St., Milwaukee 1, Wis.

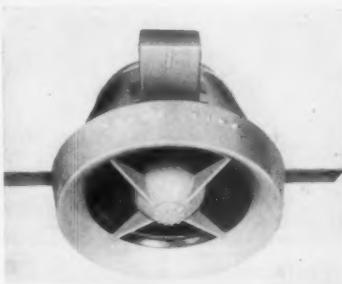
Dimmer Control

(29)

A new magnetic amplifier type dimmer control for theatrical lighting systems. Self-saturating magnetic amplifiers in the dimmer are used, permitting operation on control current of very small magnitude

and at low voltage. Only moving part is a miniature pilot potentiometer with which the operator controls dimming. Pilot potentiometer can be located at one or more convenient control stations, remote from dimmer units, making dimmers ideal for remote installation when space is at a premium. Dimmer consists of a power reactor assembly, selenium rectifier units, and a self-saturating magnetic amplifier type pre-amplifier with bias circuit elements. Load windings of power reactors are connected in series with lighting circuit.

Vickers Electric Division, Vickers, Inc., 1815 Locust St., St. Louis 3, Mo.



Fan

(30)

Home ventilating fan, 11 inches in diam., has drip-proof feature minimizing necessity for frequent cleaning. Measuring only 5½-in. high, it may be mounted in restricted joist spaces. Unit develops 300-cfm capacity.

Trade-Wind Motorfans, Inc., 5725 S. Main St., Los Angeles 37, Calif.



Rotary Limit Switch

(31)

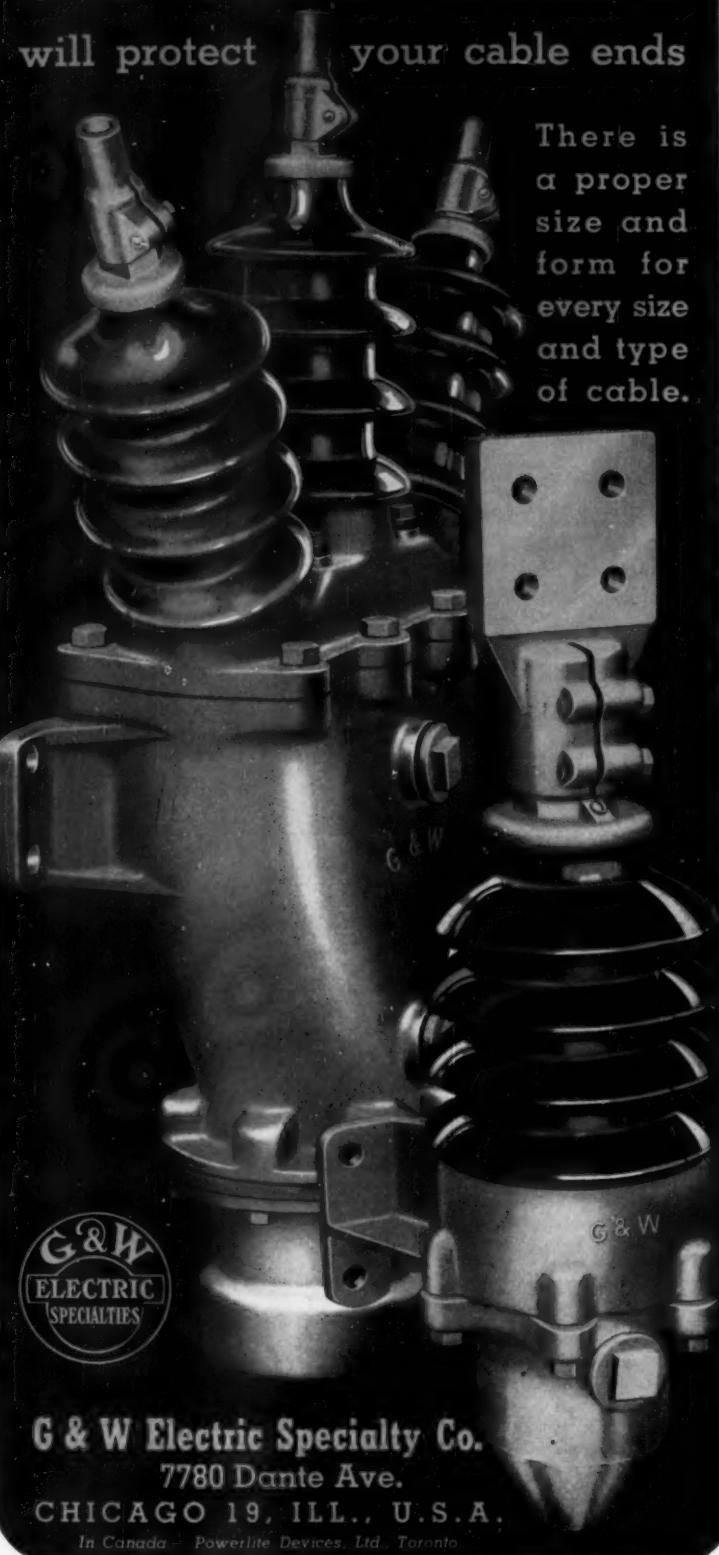
Rotary limit switch is control device with cam and gear mechanism designed for use where movement can be expressed as shaft revolutions; is recommended for reversing movement between two limits, such as the opening and closing of electrically-operated doors, windows, large valves, etc. Switch works as automatic control. Large selection of gear ratios; gears fabricated of high-quality bronze and steel supported by oilite bearings. Enclosure is a special fibre-glass alloy, resistant to shock, solutions of acids, alcohols, hydro-carbons and heat.

Gemco Electric, 25685 W 8 Mi. Rd., Detroit 19, Mich.

G & W POTHEADS

will protect your cable ends

There is a proper size and form for every size and type of cable.



G & W Electric Specialty Co.
7780 Dante Ave.
CHICAGO 19, ILL., U.S.A.

In Canada - Powerlite Devices, Ltd., Toronto

"Service-Master saves me up to one hour of service time every day"



Service-Master

THE IDEAL ELECTRICAL CONTRACTING AND MAINTENANCE BODY

Here's the body that takes a completely equipped shop to the job, and saves up to 75 minutes per day. Using the latest average service base rate of 6 cents a minute and an average saving of 30 minutes a day . . . Service-Master saves \$478.00 worth of time a year. Available in sizes for $\frac{1}{2}$, $\frac{3}{4}$, 1, and $1\frac{1}{2}$ ton chassis — regardless of age or make. The coupon below will bring complete details, with no obligation to you.

MAKE YOUR PICK-UP TRUCK A SERVICE TRUCK, TOO!

SERVICE-TWINS

for $\frac{1}{2}$ and $\frac{3}{4}$ ton pick-up trucks



These easy-to-install tool and material compartments are finished in baked-on, medium-dark green enamel. Parts bins are built-in. Doors have slam-action catches, with locks keyed alike. Available with overhead rack.

McCABE-POWERS AUTO BODY CO. 5900 No. Broadway • St. Louis 15, Mo.

Please send me complete details on:
SERVICE-MASTER SERVICE-TWINS

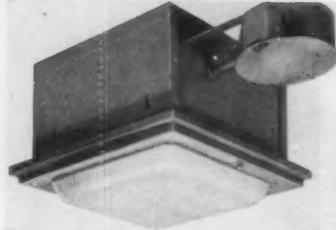
Name _____

Company _____

Address _____

City & State _____

SE _____



Prewired Lighting Unit (32)

Removable prewired 1-piece E-Z wire unit consists of outlet box, socket and reflector, all securely attached to an end plate for easy handling and splicing to existing building wire. Unit slips into extra large housing opening, eliminating wiring through small hand holes. Wiring can be easily inspected without removing recessed housing. Design makes it possible to complete wiring after housing is installed, thereby permitting fast and simple installation, service and inspection. Available in semi-recessed architectural glass and recessed ceiling types. Approved by UL.

Novelty Lighting Corp., 2480 E 22nd St., Cleveland 15, Ohio.

lights, heating units) automatically switches the plant into operation; shuts it off when all loads have been discontinued. Load is automatically held off until proper voltage and frequency are delivered. Controls for 3-wire plants may be used with grounded-neutral stand-by systems. Ratings range from 2- to 18.75-kva. Minimum starting loads from 60 to 100 watts for 2- or 3-wire generators.

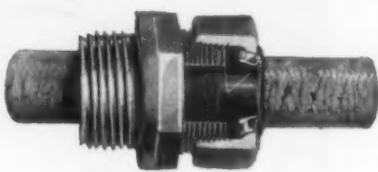
Automatic Switch Co., Orange, N. J.



Weathermaker (35)

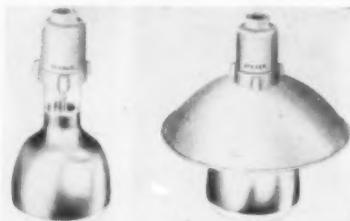
Summer Weathermaker cools, dehumidifies and provides filtered air for an entire house. When coupled with a forced warm-air furnace, unit takes advantage of the same duct system. Can be installed with its own blower, obtained either as an air- or water-cooled model, and is rated at 2-tons. Water can be eliminated entirely by installing unit as an air-cooled assembly in a yard, garage, breezeway, attic or other area exposed to free movement of air.

Carrier Corp., Syracuse, N. Y.

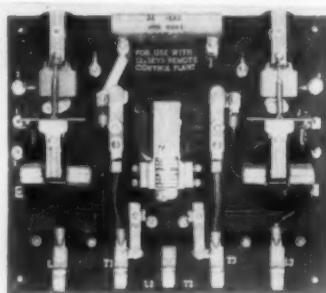


Connector (33)

A new-type connector fitting designed for watertight entrance cable protection. Connector features a conical ring which pulls tight under hex-nut or two-screw compression fitting, thus sealing a tapered Neoprene bushing around entrance cable. The cast aluminum fitting is precision-threaded, built to withstand weather and hard service. It fits $\frac{1}{2}$ -in. to $1\frac{1}{4}$ -in. hub or knock-out; cable sizes from 10/2 to 2/3. M. & W. Electric Mfg. Co., Inc., East Palestine, Ohio



Lighting Unit (36)



Control (34)

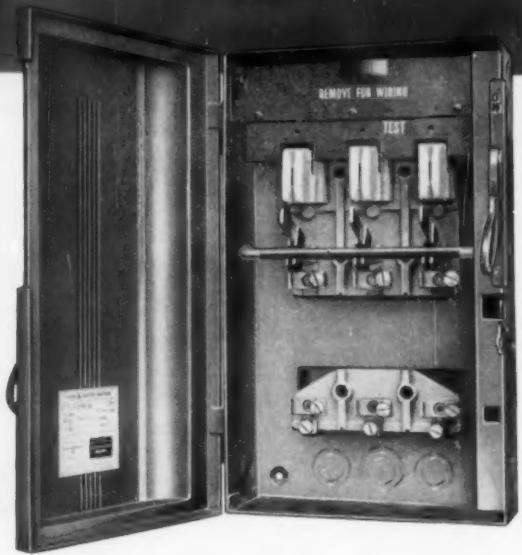
Demand start, full load, fully automatic lamp start control for use with diesel or gasoline-driven engine-generator sets. Design is such that any load (motors,

A new high bay lighting unit HB-1 designed for use with reflector flood type lamps, R-52, R-57 and 400 watt mercury vapor. Cast aluminum construction of lampholder makes unit ideal in high bay installations in factories, foundries and warehouses where atmospheric conditions might prove detrimental to ferrous metal fixtures. Where condensation or extreme moisture conditions present a problem, an aluminum shield 12 inches in diameter, HB-2, is available. A silicone gasket is recessed in neck of HB-1. It has $\frac{1}{2}$ -in. threaded opening at top for connection to pipe or conduit.

Steber Manufacturing Co., Broadview, Ill.



BUILT TO BEAT HEAT



**Cutler-Hammer's answer to the
unavoidable internal heating
that causes Safety Switches to fail.**

Engineering research authenticated by outstanding authorities has conclusively established "internal heating" to be the principal cause of safety switch failures. This "internal heating" literally bakes the life right out of safety switch parts, causing insulating materials to disintegrate and metal parts to distort and corrode. The safety switch then either becomes inoperative or it "burns up" through inability to carry the load.

In properly constructed safety switches, fuses are almost entirely responsible for this destructive "internal heating." This is not a criticism of fuses for any fuse operating up to its rated load *must* be near its melting point if it is to

perform properly when an overload occurs. And any metal operating *near* its melting point *must* be hot . . . and fuse links are *hot* . . . with temperatures running as high as 700 degrees Fahrenheit.

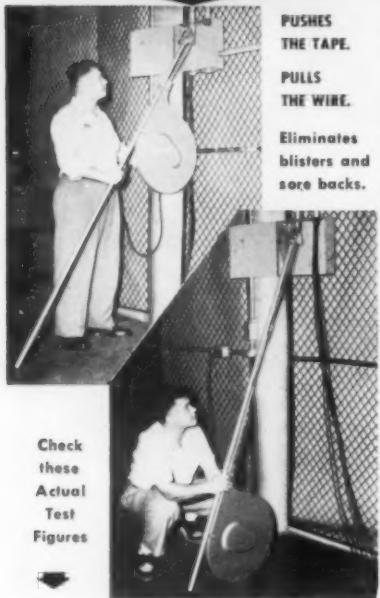
Since you cannot vent trapped heated air through a safety switch enclosure and still keep a safety switch safe, the only escape from the ravages of "internal heating" *must* come through the selection of materials for the internal safety

switch structure and the design of that structure to *withstand successfully the unavoidable heat conditions met in safety switch service.*

Cutler-Hammer Safety Switches were completely redesigned in this way *fifteen years ago* to beat "internal heating" when engineering research clearly indicated the need for *such* safety switches. Fourteen years of experience shows the Cutler-Hammer claim of better safety switch performance far more than a mere promise; it is a proven *fact* that demonstrates why there can be no other answer in safety switch selection. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee 1, Wisconsin.



PULLS WIRE at a FRACTION of former cost!



MANUAL OPERATION

Pushing the tape	{	6	MAN HOURS
1 Man pushing, 3 hrs.			
1 Man fishing, 3 hrs.	{	3	MAN HOURS
Pulling the wire			
1 Man Feeding, 1 hr.			
2 Men pulling, 2 hrs.			
Total Man Hours		9	HOURS

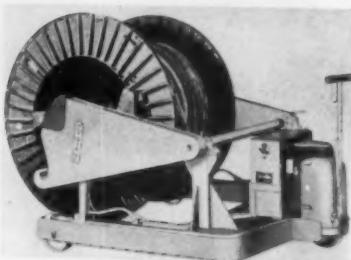
COMPARE BARTH POWER TOOL!

1 Man at Power Tool	{	1	MAN HOUR
1 Man at feed end			
TIME SAVED	8 HOURS		

THE ONLY COMPLETE WIRE-PULLING POWER TOOL

AVAILABLE THRU YOUR NEAREST
General Electric Supply Co.
Graybar Electric Co.
Westinghouse Electric Supply Co.

**The BARTH
CORPORATION**
12652 BROOKPARK RD., CLEVELAND 29, O.



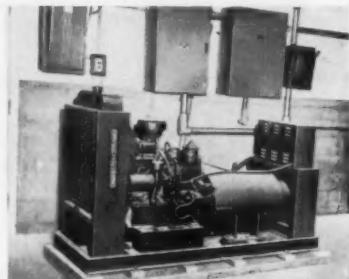
Reel Handling Truck (37)

Reel handling truck, designed for general factory and warehouse use, has hydraulic lift with capacity of 1600 lbs. and overall size of 6-by-6-ft. Maximum lift is 14 inches and rolls up to 84 inches in diam. can be handled. Travel speed is 3 mph, with two speeds forwards and backwards. Power is via an 18-volt battery, and standard accessories include "dead man" controls and pushbutton hydraulic lift system.

Moto-Truck Co., 1935 E 59th St., Cleveland 3, Ohio.

teriors are made of Neotex, a Neoprene compound, impervious to oils, greases and most chemicals. Turnex is made with heavy duty brass contacts. Caps and connectors are interchangeable with other standard locking caps and connectors. Rating: 20 amp, 250 volts, ac or dc; 10 amp; 575 volts, ac.

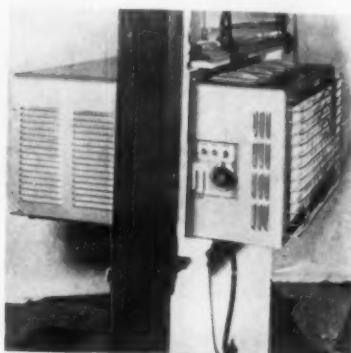
Daniel Woodhead Company, 15 N. Jefferson St., Chicago 6, Ill.



Generators (40)

New line of generators, powered by Chrysler industrial engines, have ratings of 20-, 30- and 50-kw and have readily accessible controls for both engine and generating plant located on a single, simplified control cabinet. Designed for either continuous or standby service, the engines include sodium-cooled exhaust valves, air-cooled generators, by-pass thermostat cooling systems, down-draft carburation and micro-babbitt bearings. Permanent alignment is guaranteed by a heavy welded-steel base, and units are economical in fuel consumption, smooth and quiet in operation.

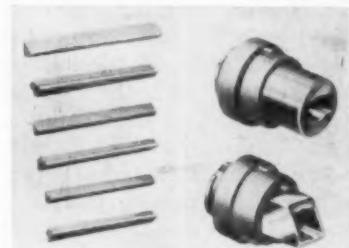
Ready-Power Co., 11231 Freud Ave., Detroit 14, Mich.



Cools and Warms (38)

Twin-feature unit cools or ventilates by air-conditioning and warms by radiant heat. For wall mounting or window insertion, it is controlled by 3 switches for ventilation, air conditioning and heating action, and has a thermostat for automatically maintaining any desired year-round temperature. Unit combines a 1/4-ton hermetically-sealed compressor and an electrothermal glass panel, shielded by decorative grille. With a consumption of 1.5-kw unit attains a maximum temperature of 440-degrees F.

Electriglas Corp., Bergenfield, N. J.



Slot Wedges (41)

Glass-bonded mica motor slot wedges and insulated brush tubes can withstand continuous operating temperatures to 650° F, making it possible to use them in critical insulating areas with higher permissible temperature rises. Thus, hp ratings may be safely increased without increasing physical size. Wedges and tubes will not loosen at high temperatures because their thermal expansion coefficient matches closely those of mating materials. Permanent tight fit is insured from cold start to 650°.

Mycalex Corp. of America, Clifton Blvd., Clifton, N. J.



Locking Device (39)

A new 20 amp, 3-wire Turnex locking attachment cap and cord connector designed to prevent accidental disconnections in spite of severe use. Non-breakable ex-

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PITTSBURGH STANDARD
SALES AGENT

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Pittsburgh Standard's Sales Control Center speeds your purchasing of rigid steel conduit, E.M.T., elbows, couplings and fittings . . . because it completely eliminates "going through channels." It is the single co-ordinator for production, sales and delivery information for all Pittsburgh Standard Agents throughout the world.

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Famous "Standard of the Trade" Products

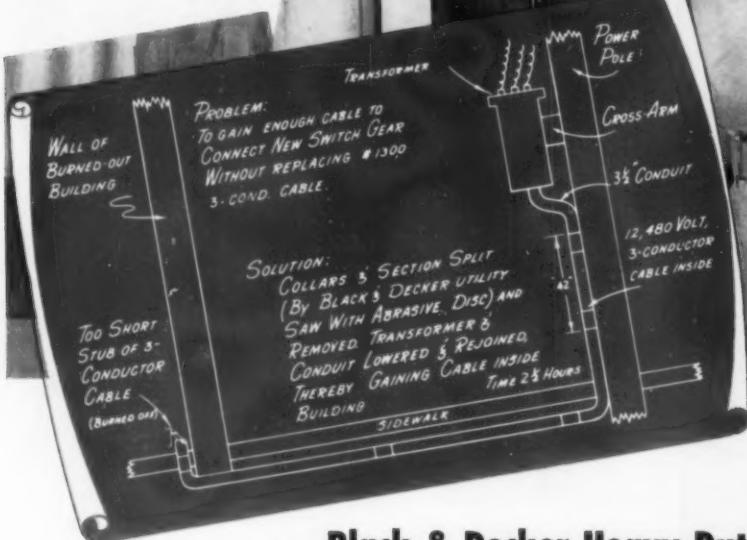
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61 BRIDGE ST., PITTSBURGH 23, PA. • Plants at Morrisville & Etna, Pa.

2-day
job in
2½ hours



... Black & Decker Heavy-Duty Saw saves \$1,300 plus

THE problem . . . the solution . . . they're shown above. But it took a Black & Decker Saw to do the job.

There were two ways that the Superior Electric Co., Dallas, Texas, could do this job on a large, completely burned-out industrial site.

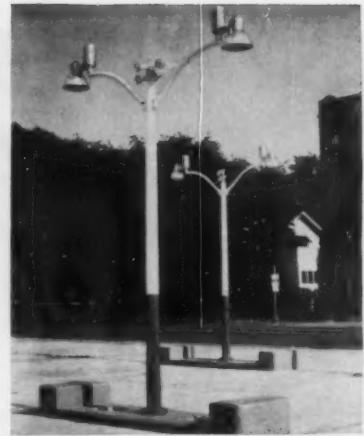
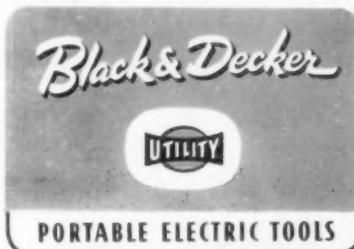
One was to melt 60 lbs. of insulation wax in the transformer to get at the connections, remove the old cable, and thread the conduit with \$1,300 worth of new cable . . . an expensive, two-day job.

The other . . . the faster, less costly way utilized a Black & Decker 6-inch Saw. It simply involved cutting the conduit, collars and sidewall, lowering the transformer on its outdoor pole, and pulling the old cable (still good as new) into the building for splicing.

That's the way the job was done. Result: 2½ hours to do a 2 day job . . . \$1,300 saved.

Typical of the savings that you can

achieve with B&D Heavy-Duty Saws? You bet! And now, with BLACK & DECKER'S NEW LINE OF SAWS you can do jobs even faster, saving still more in money and manpower. Investigate these new saws. See and try out all their new features . . . new in power, design, construction. Prices: 6-inch—\$64.50, 7-inch—\$84.50, 8-inch—\$96.50, 9-inch—\$114.50 at your nearby B&D outlet. Also write for free descriptive Catalog No. 513. Address: THE BLACK & DECKER MFG. CO., 617 Pennsylvania Ave., Towson 4, Md.



Island Light Pole

(42)

A new island light pole designed especially for mercury vapor and incandescent lighting. It has a double up-sweep arm available in 4-, 6-, or 8-ft lengths. It is possible to light a gasoline station island with one pole, which can be anchored to position the arms parallel or perpendicular to the island. When the arms are in a perpendicular position more light is distributed on the face of the pumps, the luminaires being mounted high enough to allow truck clearance. Cluster lighting may be used in the center for illuminating buildings or other objects. Water and air connections can also be incorporated in the base. This equipment is adaptable for new or existing stations.

Revere Electric Mfg. Co., 6009 Broadway, Chicago 41, Ill.



Electric Plant

(43)

A new electric plant, specially engineered for all services requiring a portable source of direct current. Designated Model 2050-M, unit is low in weight and has carrying handles so it may be taken anywhere on-the-job power is needed. Total weight is 165 lbs. and it delivers 2,000 watts dc, 115 volts. Plant is especially suited for floodlighting and operating ac-de tools on construction projects and for service by fire departments, police departments, repair crews and civil defense agencies. Plant is powered by a 1-cylinder, air-cooled gasoline engine of 4 hp and operates at 2800 rpm. It is self-contained

with a 4-quart capacity gasoline tank. Heavy-duty, close-coupled generator has a control panel which contains four twistlock receptacles for plug-in operation of tools, appliances and floodlighting equipment. A pilot light for operating illumination is also provided. Bulletin DPE is available.

Universal Motor Co., 511 Universal Drive, Oshkosh, Wis.



Infrared Generator (44)

Heavy duty infrared generator for high intensity heating requirements, specially designed and constructed for web-fed processes in the paper, plastics and textile industries. Panel measures 66 by 12 inches; is built to span large web and provides quickly absorbed "color-blind" far-infrared radiation at high intensity of 2.7-kw per sq. ft. Output is controlled from 4% to 100% of 15-kw capacity, with element temperature up to 1450-degrees F. Standard voltages are 240 and 480.

Edwin L. Wiegand Co., 7637 Thomas Blvd., Pittsburgh 8, Pa.



Heat Lamp (45)

New 1550-watt infrared industrial heat lamp has specialized applications for commercial drying, baking and heating; provides effective source for fast drying of printers' ink, specialized soldering operations and quick toasting. Lamp delivers three times more radiation per sq. in. than conventional 375-watt infrared lamp. Equipped with two separate filaments, lamp may be operated at 650-, 900- or 1550-watts, thereby permitting close control of infrared output. Lamp is highly resistant to thermal shock and is not affected by spattering liquids during operation. Has built-in gold reflector that projects useful heat over angle of 120° and maintains from 90- to 95% of initial reflectivity during life of lamp.

Sylvania Electric Products, Inc., 1740 Broadway, New York 19, N.Y.

Look...the New 40A RIDGID Tristand

with built-in folding tray



The Tristand you've been wanting. Now stand and tray all one unit—no loose parts. Extra-light weight, stronger more rigid than ever. Full size vise base—3 benders, ceiling brace screw, pipe or conduit rest, new tool-hanging slots. Designed for the utmost service for your money. See the new RIDGID 40A Tristand at your Supply House! Immediate deliveries!

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MAKE TOUGH JOBS EASIER

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IN 15" OR 18" SIZES

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Joist BORING MACHINE

New one-piece self-centering bit chuck makes this machine the best you can buy. High-speed: takes bit thru level holes in the toughest joist. Adjustable 4 1/2 to 13 1/2 ft. Built for tough, rugged service. Simple to use. Write for catalog TODAY.



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For determining the force required to actuate delicate mechanisms.



Here is a new instrument that has quickly become an indispensable aid to measure, calibrate and standardize the pressure or power required to actuate fine precision mechanisms and spring tensions of ELECTRIC CONTACTS - RELAYS - CLOCKS - TELEPHONES - BUSINESS MACHINES - MICRO MOTORS for Electric Razors - WINDSHIELD WIPERS - TIME SWITCHES - ETC...

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WRITE FOR ILLUSTRATED FOLDER

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200-EC Lafayette St. • New York 12, N.Y.



Switchboards

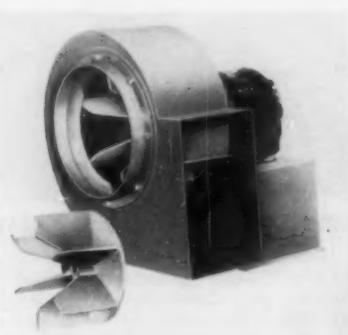
(46)

A new line of switchboards for low voltage distribution applications. An isolated wiring trough provides ample space for laying conductors. Two drop-off openings per section assure neater and safer wiring. Higher short circuit capacity of main bus bars results from edgewise mounting in a unique clamping arrangement. More compact construction and reserve space for future circuits. Flexibility of circuit arrangement is also standard with new design. Switchboards provide standardized sections for branch circuit breakers or switches and standardized sections for main incoming line equipment. Group of sections necessary to handle various components are bolted together to form a rigid assembly.

Square D Company, 6060 Rivard St., Detroit 11, Mich.

to 80 volts) or power (110- or 220-volt). After selector panel is moved to desired output position, unit automatically provides proper current characteristics for the purpose desired. When used as a power unit, generator provides 110-volt, single-phase 2-wire 60-cycle ac, or 3-wire single-phase 110/220-volt, 80% P.F.

Hobart Brothers Co., Hobart Square, Troy, Ohio.



Kitchen Exhaust

(49)

Kitchen hood exhauster is designed for continuous duty with 8-, 9- or 10-inch ducts; uses 1750-rpm motors sized at 1/6-, 1- or 1/2-hp. Unit has a cast-aluminum self-cleaning wheel which will not load up with dirt or grease or retard air flow. Compact and easy to install, it has resilient mounting, automatic thermal overload protection and sleeve bearings. Drive covers are available for outdoor installations. Bulletin SDA-193 available.

Peerless Electric Co., West Market St., Warren, Ohio.



Radiant Heater

(47)

Electrically operated Glassheat panel, with thermostat attached, is constructed of tempered glass, fused with aluminum strips. Infrared rays are projected by means of metal reflector behind the panel. Unit may be recessed or surface-mounted. Measuring 16-by-24-inches, the wall panel operates on ac only and is rated at 1000 watts.

Continental Glass Heating Corp., 1 E 35th St., New York 16, N.Y.



Photoelectric Switch

(50)

Lumatrol photoelectric light switch may be plugged into any luminaire or circuit. It measures 4 inches in diameter, 5-inches in height; weighs 1 1/2-lbs. Sensitivity to light is more than 0.5-candlepower. Has time delay of 2 minutes, thereby preventing activation due to momentary flash of flash-, head- or landing-lights. Contains no relays, mercury switches or condensers; has weatherproof translucent case providing sensitivity to light from all directions. Simplified installation.

Micro Balancing, Inc., Garden City Park, L.I., N.Y.

For Welding and Power

(48)

A combination power plant and arc welder has a selector panel in combination with a standard control panel and the unit can be used for either welding (60

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DUTCH BRAND PLASTIC TAPE

thin . . . strong . . . flexible . . . 150% stretch

Here's quality! Years of research making electrical tape that meets electrical insulating requirements is behind the making of DUTCH BRAND Plastic Tape.

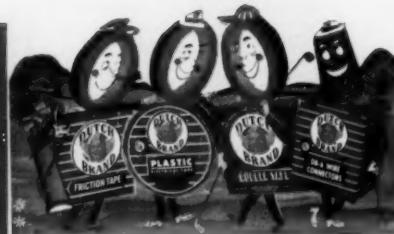
DUTCH BRAND Plastic Tape is thin but strong . . . flexible with 150% stretch . . . dielectric strength resists 1000 volts per mil of thickness . . . withstands weather and resists oils, acids and corrosive chemicals. It is available in all widths . . . in .007" thickness or heavy duty .010" and .020" thickness for heavy duty work . . . for use with power driven tape machines. It is available at your Electrical Wholesaler. For top quality be sure to specify DUTCH BRAND when you order.

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DUTCH BRAND FRICTION TAPE

DUTCH BRAND Friction Tape is well known for quality for over forty years. It is free of pin holes . . . has correct adhesion . . . has long life and stands up on the job. Dielectric strength is 2000 volts for a single thickness.



DUTCH BRAND RUBBER INSULATING TAPE

Resists up to 18,000 volts through a single thickness. It fuses instantly without heat . . . contains no corrosive chemicals . . . has long life and is dependable. This tape serves a very definite non-replaceable service under electrical codes meeting electrical insulating requirements.



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"DB" Wire Connectors are made to exacting specifications of phenolic material, they are weather-proof . . . vibration proof and resist pull-out. They are designed with long skirt for full insulation protection. Knurled design makes them easy to handle and apply. Available in four standard sizes. Sell "DB" Wire Connectors along with DUTCH BRAND Electrical Tapes.

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Cotton Insulating- Tapes

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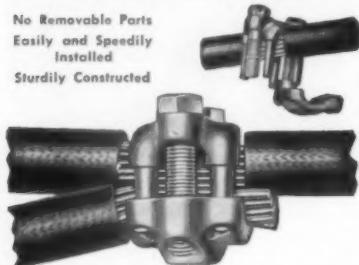
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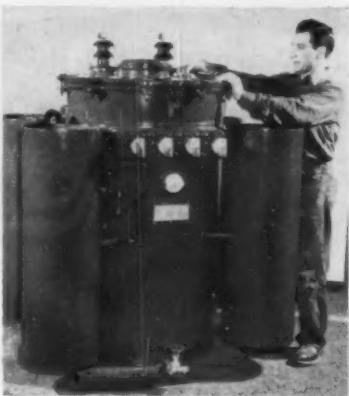
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Transformer

(51)

A new substation-size transformer featuring a new cooling method, and reductions in weight and height. Cooling method utilizes chimney-type radiators instead of numerous tubes. Weight of transformer has been reduced more than 6% and height $2\frac{1}{2}$ feet, or more than 30%. Unit has large smooth surfaces, making it easier to paint. It is available in ratings of 250 kva, high voltage 15,000 volts and below.

General Electric Co., Schenectady 5, N. Y.

a heat-leveling adjustment that provides control accuracy to within one-half degree. Because sound of switching action has been eliminated, relay can be installed in or near electrically heated room. Built to carry high-amperage heat loads of electric heating, the low-voltage controlled relay is available in either a single-switch model which can accommodate a single circuit up to 4,600 watts capacity, or a two-switch model which can carry two 4,600-watt circuits. Instrument is mounted horizontally with large-size vents to provide maximum reaction to changes in room temperature. Switching action is accomplished by a 17.5-ampere Micro switch which provides a 4,000-watt resistance load rating at 230 volts.

Minneapolis-Honeywell Regulator Company, 2753 Fourth Ave. S., Minneapolis 8, Minn.

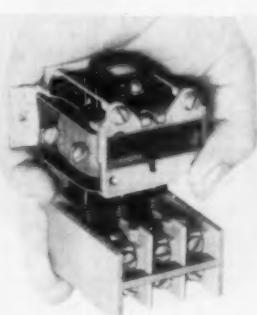


Indicator

(54)

A high-low voltage indicator designed for use with portable, or stationary industrial equipment. Unit is a bakelite panel with two glow-lamp pilot lights marked "High" and "Norm", and two test jack receptors. Panel is mounted on a cast aluminum Type FS junction box with conduit fittings. It is suited for use with equipment whose efficiency is dependent upon a certain voltage range. Model 961 indicates a low of 95 to 105 volts, and a high of 130 to 140 volts. Model 960 a low range of 190 to 210 volts and a high of 235 to 255 volts. Both models work on ac or dc.

Industrial Devices, Inc., Edgewater, N. J.



Contactor

(52)

"Little Giant" magnetic contactor is rated up to 5 hp at 208-550 volts. Furnished in 2, 3 or 4 poles they feature small size, light weight, easy access to coils and contacts plus simplicity of construction. Wide contact gap, $21/64$ -inch, is especially advantageous in reversing contactors to avoid flashover during rapid reverses. They are adaptable to applications requiring a compact magnetic switch for intermittent or continuous duty.

Furnas Electric Co., 1067 McKee St., Batavia, Ill.

Controls

(53)

A new line of automatic controls especially designed for electric heating. Instruments include both an improved line-voltage thermostat and a new silent relay for use in very high-amperage installations. New "round" thermostat is available for use with silent relay system. It features a single, easy-to-read dial, an improved dust-free mercury switch and

Thermostat

(55)

A new thermostat for room heaters and conditioners, called Room-Temp, can be used to control air blast heaters, unit heaters, radiant heat panels, furnaces or air conditioners. One of the features is its ability to handle currents as high as 30 amps, 125/250 volts, without a circuit relay or contactor. It can be mounted on appliance chassis with one or more rivets or screws and has accessible terminals for simplified wiring. Positive snap-action to eliminate interference in radio and television reception combined with sensitive bimetal temperature response at a narrow differential make an accurate and desirable control. Thermostat is available with a single pole, single throw, or single pole, double throw.

Westinghouse Electric Corp., Pittsburgh 30, Pa.

UNISTRUT concrete inserts, steel channel, fittings and clamps support maze of conduit in trapeze style framework.

ADJUSTABLE UNISTRUT FRAMING

saves time,
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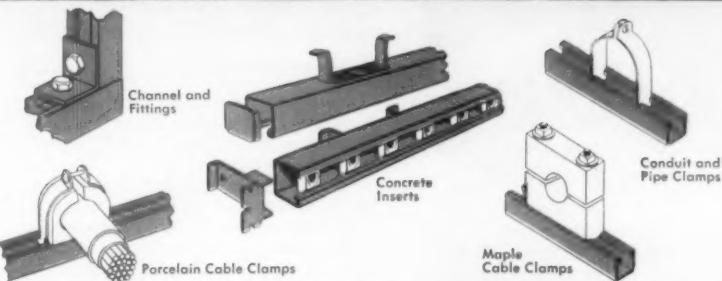
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Versatile UNISTRUT steel structural supports reduce engineering detailing, permit rapid, on-the-job erection, allow changes or additions at any time.

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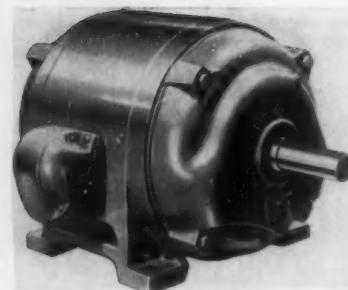
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protecting jacket of
all flexible BRONCO 60
Certified portable
cord and cable is certified
to contain not less
than 60% Neoprene
by weight.



Motor

(56)

Compact motor with NEMA-specified features is designated as Uniclosed, Type H, and gives compact, drip-proof and splash-proof protection. Frame is solid 1-piece cast iron, stator is pre-wound, frame sizes run from 182 to 184 and end brackets are of design to prevent intrusion of water through air intakes. Improved slot design of laminations and reinforced asbestos-protected windings are other features. Lubriflush lubrication of bearings provides means of replacing old grease with new without the necessity of disassembling motor or disturbing bearings, while air intake is designed to avoid pick-up of dirt and dust from floors.

U. S. Electrical Motors, Inc., Box 2058, Los Angeles 54, Cal.



Wiring Devices

(57)

Many hundreds of electrical combinations are now possible through the use of the new line of Interchange wiring devices, wall plates and straps. The line, for residential or industrial use, features an assortment of switches, receptacles, pilot light, nite lite, pilot light receptacle, mounting straps and a line of wall plates holding up to six devices. Devices are easily attached to mounting straps for installation into outlet boxes. All devices are interchangeable with all standard lines of wiring devices. They are of bakelite totally enclosed mechanisms. Listed by Underwriters' Laboratories.

Eagle Electric Mfg. Co., Inc., 23-10 Bridge Plaza South, Long Island City 1, N. Y.

Motors

(58)

A new line of two-speed fhp motors designed for use on evaporative-cooler, attic, air-circulating, and window fans. They can be mounted in any position. The line is made up of split-phase and capacitor-start types with speeds of 1725/1140 rpm. The split-phase models are rated at 1/6, $\frac{1}{3}$, and 1/3 hp, 115 volts, 60 cycles. The capacitor-start are rated at $\frac{1}{2}$ and $\frac{1}{3}$ hp, 60 cycles, 115 or 230 volts. Single-speed motors for fan applications are also available in these ratings. All motors are rated for 50° C temperature rise and are available with or without automatic-reset thermal protection.

General Electric Company, Schenectady 5, N. Y.

Radiation Measurement (59)

Remote area monitoring system for radiation measurement is recommended for radiation therapy installations, nuclear pile and isotope separation, industrial radiography exposure, civil defense and atomic tests, etc. Using simple circuit, accurate radiation measurement from background to as high as 100,000 R/hr can be made in several steps, and utilized plug-in construction permits addition of stations as desired. Recorders and alarm devices may be easily added. Stable low voltage battery circuit permits operation of chambers up to 5000 ft. from control panel without need of amplification.

Jordan Electronic Sales, 119 E. Union St., Pasadena, Calif.

Concrete Drill (60)

Portable electric drill using diamond coring bits drills holes in concrete up to 40 times faster than manual methods. This drill, the Penndrill Model E, is a complete unit, complete with lever operated press for advancing or retracting the bit. It operates on either 115- or 230-v ac or dc and is adapted for diamond core drilling of vertical, horizontal or angle holes in concrete, also marble, granite, tile, glass, brick and porcelain. Holes range from $\frac{1}{2}$ - to $6\frac{1}{2}$ -inches, and the drill is also adapted for drilling with steel hole saws and twist drills.

Pennsylvania Drilling Co., 1205 Chartiers Ave., Pittsburgh 20, Pa.

Air Conditioners (61)

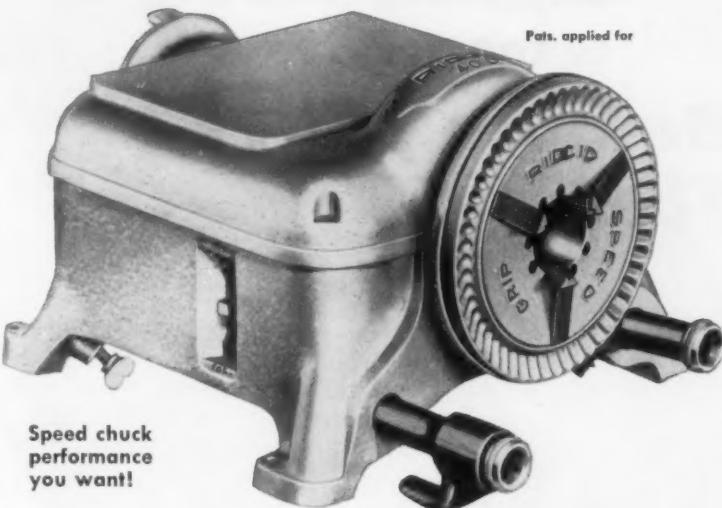
Redesigned line of compact, self-contained flow-cold packaged liquid chillers are factory tested and pre-piped, requiring only simple electrical and plumbing connections on the job. Units provide for air conditioning, also industrial refrigeration, plus heating of houses or office buildings. Units for heating range from 26,000 to 252,000 BTU/hr while cooling units go from 15- to 220-tons of compression.

Acme Industries, Inc., Mechanics & Ganson Sts., Jackson, Mich.

Now!... New 400A

RIDGE

Power Drive with New Speed-Grip Chuck



Entirely new principle of gripping conduit

Not just another hammer chuck

★ Speed-Grip Chuck guaranteed to hold any kind of pipe or conduit securely both ways, *forward and reverse*.

★ No slipping, even in driving geared tools.

★ Easy to operate: close grip-tooth jaws on work with hand wheel, sock it lightly—motor action makes it hold still tighter.

★ Releases easily by turn of hand wheel.

Scores of thousands of these remarkable "400's" are turning pipe or conduit everywhere for easy threading, cutting, reaming with hand tools, saving time and work. For $\frac{1}{8}$ " to 2" pipe or conduit, $\frac{1}{4}$ " to 2" bolts, but lots of power for geared tools to 12". Now, with new Speed-Grip Chuck, it's unbeatable. **No. 400 with lathe-type chuck also available.** See it at your Supply House.

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Here's Why millions more



Patented, No. 1,933,555

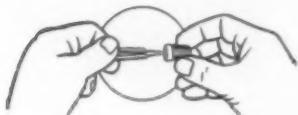
are used than
any other wire
connector...

**Because
They're Safe**



They twist, thread, grip and insulate all in one operation. They're pull-proof, shake-proof — make pigtail splices *actually stronger than the wires they connect*. Now, new materials and methods make "Wire-Nuts" better than ever.

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Contractors sizes 74B and 76B are fully approved as pressure cable connectors for general use in all types of branch circuit wiring.



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Distributors

Product Briefs

(62) Compensation for prolonged periods of power interruption is obtainable with new 12-hr. self-regulating electronic **time system** made by International Business Machine Corp., New York, N. Y. . . . (63) Homelite Corp., Port Chester, N. Y. has announced a 22-lb. 3 1/2-hp lightweight **chain saw** . . .

(64) Abbeon Supply Co., Jamaica, N. Y., has a line of lightweight magnesium safety platform **step ladders** . . . (65) Chicago Precision Machine Co., Chicago, Ill. produces hook-type **carrying devices** that fit over window sills of any make automobile for carrying conduit, lumber, rods. . . . (66) Combination portable electric **hand lamp** and **flashing red beacon** is obtainable from U-C Lite Mfg. Co., Chicago, Ill.

(67) Thermostatic controlled 3-speed 20-inch blade **window fan** is made by General Electric Co., Bridgeport, Conn. . . . (68) Two fully-enclosed repeat-cycle **electronic timers** have been announced by C. C. Wilson & Co., Huntington, W. Va. . . . (69) Weltless (parallel thread) **tape** of Fiberglas yarns, adaptable for many applications, is available from R. I. Tapes, Inc., Central Falls, R. I.

(70) Slow-speed 24-in. reversible **window fan** has 6000-cfm capacity; is made by International Oil Burner Co., St. Louis, Mo. . . . (71) Associated Research, Inc., Chicago, Ill., announces a portable dry-cell-operated **resistance measuring instrument**. . . . (72) All-molded **indicating lamp** for switchboard steel panels has been announced by General Electric Co., Philadelphia, Pa.

(73) High-pressure side-break **switch** in ratings from 7 1/2- to 69-kv for transmission and distribution systems is available from Southern States Equipment Corp., Hampton, Ga. . . . (74) **Window fan** with 3-speeds, 2500-cfm rating and 16-in. blades can be tilted to any desired angle; is made by W. W. Welch Co., Cincinnati, Ohio. . . . (75) Transfer **volt-ammeter** for measuring ac through frequency range from 20- to 20,000-cycles has been announced by Charles Engelhard, Inc., East Newark, N. J. . . . (76) Mend-It Sleeve Mfg. Co., Piedmont, Calif., makes an easily applied crimpable **sleeve** for joining or splicing electrical wiring.

(77) General Electric Co., Schenectady, N. Y., has announced series of heavy-duty oil tight all-directional **indicating lights** in six colors. . . . (78) Minnesota Mining and Manufacturing Co., St. Paul, Minn., announces a new epoxy type electrical **insulation resin** called Scotchcast. . . . (79) Commander Manufacturing Co., Chicago, Ill., has multi-speed **fans** for desk, pedestal, hassock, reversible window and all-purpose applications.

(80) Dymond portable hacksaw cuts steel, aluminum, brass, bronze and conduit; is made by La-Ror Industries, Inc., Howell, Mich.

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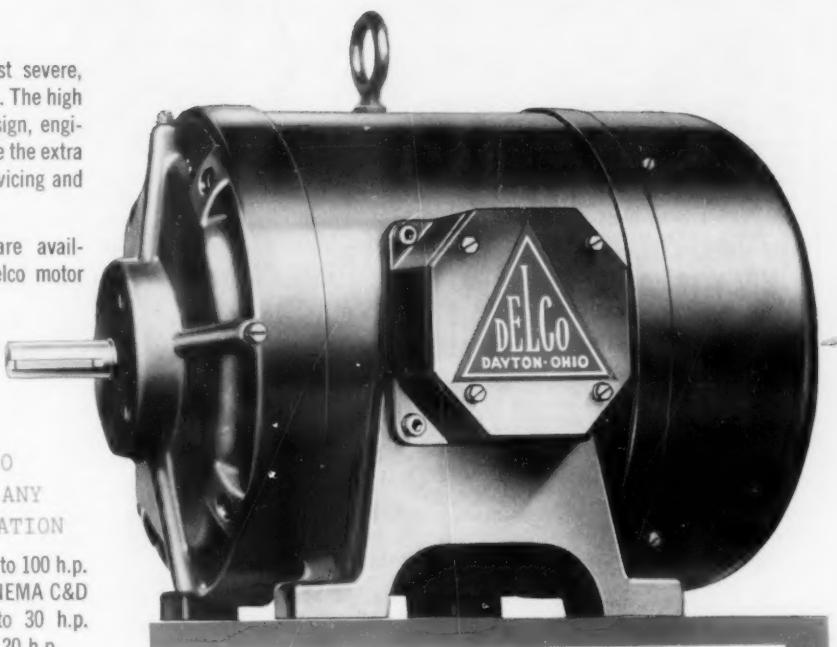
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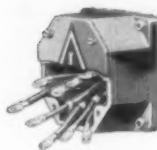
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(81) WIRE TABLES for use of building wires, cables, and EMT. 8-page pocket reference. Columbia Cable & Electric Corp.

(82) CONTROL CENTERS—specifications, design features, variations, applications; complete instructions for planning a unit are given in colorful 24-page booklet. Clark Controller Co.

(83) MERCURY SWITCHES are described as to dimensions, ratings and applications in catalog 90. Micro-Switch.

(84) FLOODLIGHTING STANDARDS designed specifically for shopping center parking lots. Design data, brackets, and typical installations shown in Folder LS-15. Union Metal Mfg. Co.

(85) UNDERGROUND DUCT installation techniques and new flat-sided OCT-O-DUCT soapstone conduit are described in 8-page manual. Soapstone Duct Co.

(86) OIL-TIGHT PUSHBUTTONS, indicating lights, selector switches and accessories. Booklet gives dimensions, applications, prices. GEA-5779B. General Electric Co.

(87) MOTOR SELECTION GUIDE is feature of new illustrated catalog for 1 to 50 hp ac motors. Brook Motors Corp.

(88) EMERGENCY LIGHTING CONTROLS including transfer switches, generator starters and relays are discussed in publication No. 528. Automatic Switch Co.

(89) SMALL ELECTRIC BRAKES and clutch-coupling are illustrated in photos and drawings, with pertinent mechanical data. Bulletin 6158. Warner Electric Brake & Clutch Co.

(90) SPORTS LIGHTING applications of the G-E L-69 floodlight. GEA-6067. General Electric Co.

(91) MAGNETIC CONTACTORS, sizes 00 to 6 can be adapted for four types of control circuits. Bulletin 502. Federal Electric Products Co.

(92) CABLE RACKS, may also be used for trough, conduit etc., Cat. No. 853. Rakit Corp.

(93) SYNCHRONOUS MOTORS—100 hp and larger at speeds of 450 rpm or less. Bulletin 05B8008 discusses design features. Allis-Chalmers Mfg. Co.

(94) PHOTOELECTRIC CONTROLS are described in new catalog. Autotron Co.

(95) LOOM SWITCH—lint-tight for loom, wall or pedestal mounting; dimensions, features, ratings are shown in GEA-6001. General Electric Co.

(96) PARABOLIC LATERAL LOUVERS reduce lengthwise brightness in fluorescent troffers. 4-page folder. Day-Brite Lighting, Inc.

(97) CLAMPED CORE BALLAST for 14-, 15-, 20-watt lamp operation. Requirements, ratings, prices. GEA 6040. General Electric Co.

(98) ALARM AND CONTROL CIRCUITS utilizing meter-relays. Bulletin 112 gives diagram, components, prices and operation of 11 types of circuits. Assembly Products, Inc.

(99) LIQUID LEVEL CONTROL and measuring systems with efficiency comparisons, diagrams, tables are described in Bulletin 1160. Minneapolis-Honeywell Regulator Co.

(100) BLOWER HEATING UNITS with integral electric furnace for industrial, residential and commercial installation. 4-page folder gives application data and ratings. Kilbury Mfg. Co.

(101) CONTROL SELECTION GUIDE—6-page folder gives ratings, photos, prices of standard G-E motor starters and push buttons. GEA 6061. General Electric Co.

(102) DISTRIBUTION TRANSFORMERS (250-500 kva) with construction and standardization characteristics; economic handling and operation procedures; accessories. Booklet B-6134. Westinghouse Electric Corp.

(103) EXPLOSION-PROOF STARTERS, circuit breakers, combination motor starters added to Unilet line are described with complete data on dimensions, applications, pictures and prices in new section 12-A of Unilet catalogue. Additional 25-page supplement revises section 12 of same book. Appleton Electric Co.

(104) HIGH-TEMPERATURE CAPACITORS operate from -55° to $+125^{\circ}\text{C}$. Available in several case styles. Bulletin No. AB-19 gives sizes, ratings, mounting styles, specifications and test performance. Astron Corp.

New Books

Introduction to Electric Fields (105)

A vector analysis approach applying Maxwell's equations to the solution of electric and magnetic field problems by vector methods; an introduction to vector potential. Appendix on Fluid Mapping. By Walter E. Rogers. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. 333 pp. \$7.50.

Annual Report of TVA—1953 (106)

TVA construction and operations power, water control, and chemical engineering are discussed along with a history of the authority; complete statistical data. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 171 pp. 65 cents.

Silicones and Their Uses (107)

A general survey of the properties and application of silicone compounds; their benefits to electrical equipment. By Rob Roy McGregor. McGraw-Hill Book Co., 330 West 42 St., New York 36, N. Y. 302 pp. \$6.00.

Materials and Processes (108)

Current engineering materials and manufacturing processes are described for the man who works with industry. A part of the General Electric series written for the advancement of engineering practice. By James F. Young. Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 1074 pp. \$8.50. 2nd Edition.

Personnel Management (109)

The standard text on the theories and techniques of this aspect of modern business practice; includes record-keeping, training, incentives and communicating with the employee. By Scott, Clothier, and Spriggin. McGraw-Hill Book Co., 330 West 42 St., New York 36, N. Y. 690 pp. \$6.50. 5th Edition.

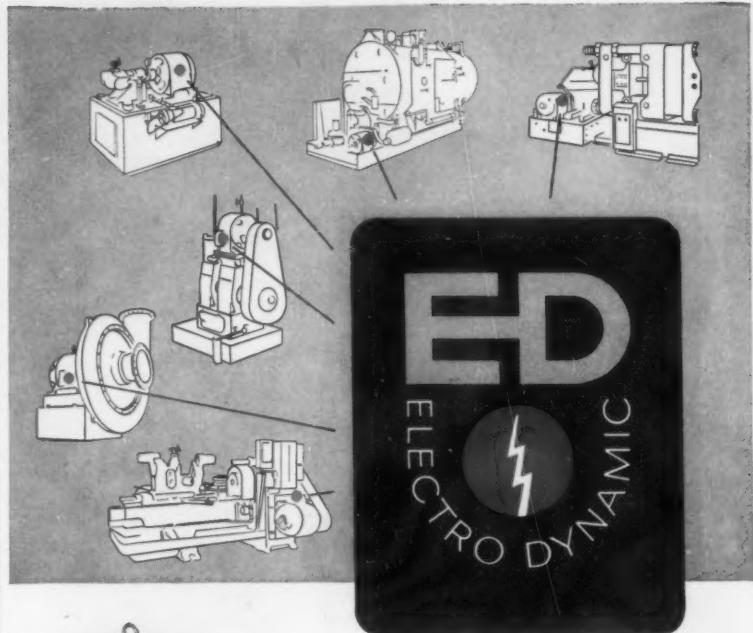
Films

The Story of the Round-Wound Transformer (110)

Describes manufacture and testing of distribution transformers through 500 kva, 16 mm with sound. Available to technical audiences upon request. Line Material Co., 700 W. Michigan St., Milwaukee 1, Wis.

Fire Prevention Shorts (111)

A new listing of 22 films designed for various types of audiences. National Board of Fire Underwriters, 85 John St., New York 38, N. Y.



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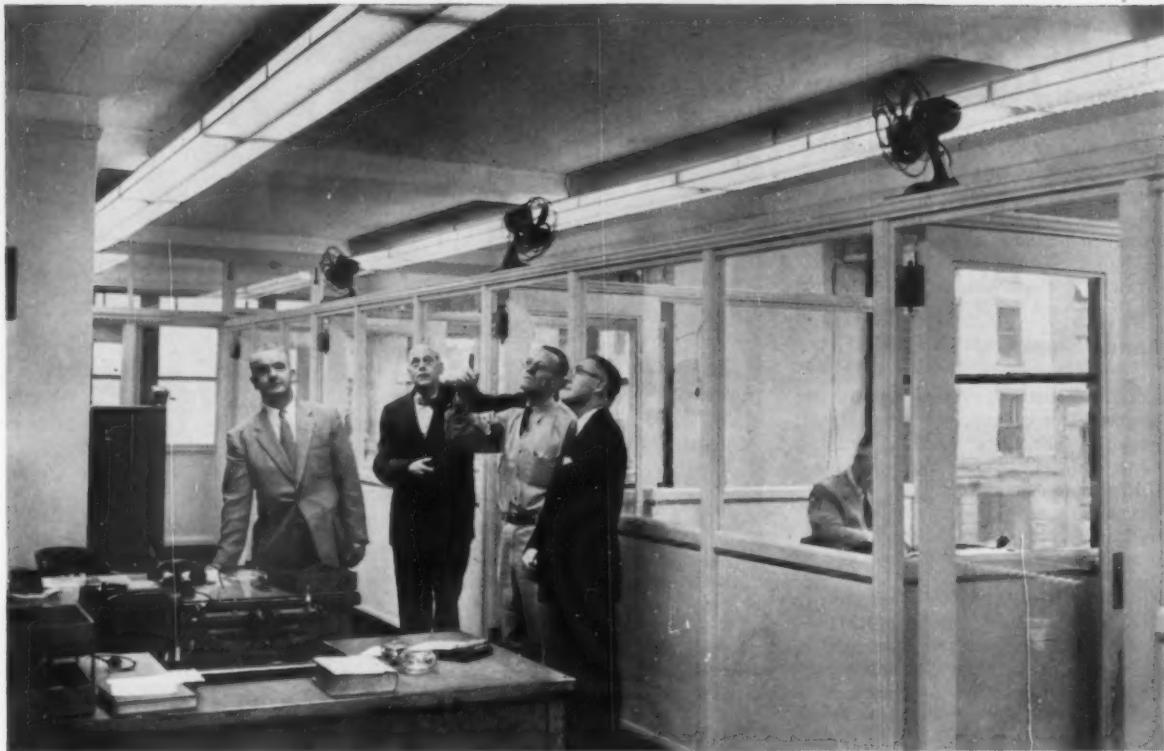
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Reader's Quiz

Slip Ring Motor Winding

QUESTION A 25—We had a 75 hp slip ring motor, on 2300 volts, driving a pump. This motor was overloaded so that the rotor winding heated and burned the insulation off the coil ends. The stator winding was not damaged. The rotor is 90 slots, with 5 turns to the coil. I would like to know if the 5 turns could be bonded together instead of being insulated as a coil? Would this bonding produce excessive heat?—E.S.H.

ANSWER TO A 25—Since a slipping motor is used, I assume the pump is reciprocating instead of centrifugal, hence a high starting torque is required. The bonding together of the five rotor turns would, in effect, be substituting a single-turn coil of lower resistance and much lower inductance for the original five turns. Since the secondary resistance of a wound-rotor motor must be designed to fit the rotor characteristics, and the single-turn coil would have less voltage induced than the five-turn coil, the current in the resistance, and therefore in the rotor, would be less when starting. So the starting torque of the motor would be considerably less. However, the torque at rated speed, and the load carrying ability of the motor should be as good as ever, since the rotor would be practically the same as a squirrel cage rotor, after the starting resistance is shorted out. The bonding of the coils should not produce excessive heat.

The fact that the rotor is giving trouble but not the stator also indicates that the load may be highly fluctuating in torque requirements, as for instance, a plunger pump. If so, a fly-wheel may be of some help.—E.A.M.

ANSWER TO A 25—In considering the steady-state performance of a symmetrical polyphase induction motor, it is always advisable to consider it in terms of the motor's transformer equivalent. If the five turns in each rotor coil are bonded, a rotor winding results with one-fifth the number of turns/phase, and one-fifth the rotor resistance/phase found in the original machine. The characteristics of the primary or stator winding remain unaffected within a good approxima-

tion. Accordingly, for a given load, the current in the secondary or rotor winding will be five times as great as the rotor current in the original machine. Since, by Ohm's Law, the power or heat loss in the rotor is the product of the rotor current squared and the rotor resistance, the heat loss in the rotor of the new machine will be five squared times one-fifth, or five times as great as the heat loss in the rotor of the original machine. The rotor would definitely overheat, and burn out.

This should not discourage the common practice of shorting out, or bonding together the conductors of only one coil in the machine as an emergency expedient. Naturally, the characteristics of the machine are modified somewhat; however, in general, the machine can limp along, sustaining production until a replacement or repair can be effected. The performance of the machine under this unbalanced condition can be predicted by applying Fortesque's method of symmetrical components.—J.S.

Direction of Motor Rotation

QUESTION B 25—From time to time we find it necessary to change direction of rotation on repulsion induction motors. Can someone suggest an easy, accurate method of locating the point where peak starting torque occurs when no brush setting is indicated? —H.G.C.

ANSWER TO B 25—The easiest and most accurate way of locating brush position on a repulsion type motor for maximum starting torque is by the prony brake method. If a prony brake is not immediately available, a piece of wood, small angle iron or flat iron clamped in right angle position as an arm to the motor shaft and fastened to a scale a foot or two from the center of the shaft will serve the purpose.

Arrange the brake arm on the proper side of the motor so that rotation of the armature will pull down on the scale. As a safety precaution, the arm should be tied to prevent its throwing backward in case the motor is accidentally reversed.

With the brake and scale arranged apply normal line voltage to the motor and shift the brushes to the point which gives the highest reading on the scale.

If foot-pound torque is desired to be known, measure the distance in feet from the center of the shaft to the point of attachment of the scale, to the arm and multiply the result by the pounds reading on the scale.

If the brushholder is supported or positioned by the end-bell, the above method should be used for locating brush position anytime the end-bell is removed from the motor. The brush position lines are not always accurate because the end-bell is not restored to an exact position every time.

The above method is also useful in determining the proper size capacitor for a single phase capacitor-start motor. All readings should be taken as quickly as possible for accuracy and the motor disconnected from the line in minimum time, especially capacitor-start motors.—J.A.

ANSWER TO B 25—In my experience the position of the brushes for obtaining maximum starting torque has been found to be approximately 45 degrees past the neutral position in the opposite direction to the rotation of the motor.

However, this can be easily verified by mounting a flanged pulley, or facsimile, on the shaft of the motor and coiling cord or rope around the pulley, in the direction of rotation. One end of the cord is attached to a spring balance, the other end is left free. If sufficient turns of the cord are made on the pulley the rotor will be locked when power is supplied to the motor. The brushes should then be adjusted until the maximum deflection is recorded on the spring balance. This then will be the correct position for maximum starting torque. Care should be taken so as not to burn out the windings.

It must be remembered, however, that maximum starting torque does not necessarily mean maximum breakdown torque and in normal practice, it is often found better to adjust the position of the brushes to some optimum point between the maximum starting torque and the maximum breakdown torque.—E.S.

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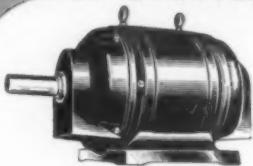
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Remote Control Door Operator

QUESTION C 25—Can any reader supply a simple garage remote control door opener circuit using a radio transmitter and receiver? Do these units require Federal Communications Commission approval for operation?

—L.W.F.

ANSWER TO C 25—An excellent article describing the remote control garage door opener using a radio transmitter and receiver appears in the February 1954 issue of "Radio and Television News". A Federal Communications Commission "Station" license is required.—E.M.L.

ANSWER TO C 25—There is no such description as "simple" in regard to the transmission of a suitable signal and its reproduction in a receiver amplifier for useful relaying purposes, and I have no knowledge as to what regulations the FCC issues to cover such equipment. In the interests of economy, convenience and initial installation time, you should consider one of the many excellent door operators manufactured today. My experience with the Horton Door Operator Company during 1941 and 1942 (now under a new name) lent emphasis to the simplicity of both the electrical and mechanical structures of an operator. Photo-electric, photo-cell, electromagnetic, buried mercury switch and underpavement pressure switches combined with key and/or button-operated post and house control are but a few of the several schemes featured by dependable vendors. Six are listed below:

Barber-Coleman Company, Rockford, Ill.

Electric Power Door Company, Minneapolis, Minn.

Peelle Company, Brooklyn, N. Y.

Photobell Company, New York, N. Y.

Quincy Manufacturing Company, Tiffin, Ohio

Robot Appliances Company, Dearborn (Detroit), Mich. —R.R.T.

Voltage of Electric Shock

QUESTION D 25—In a 110-220 volt 3-wire ac neutral system the ground connection has 1000 ohms resistance and a person touches a live wire. What voltage does he get through his body?

—R.S.

ANSWER TO D 25—The resistance offered by the human body will vary

greatly, depending principally on skin resistance, and area of contact.

If we assume that the person touching the live wire is well grounded; standing in a tub containing soapy water, for an example, and if we also assume that the hand contacting the live wire is also covered with soapy water, then if we imagine that the total opposition to current flow (including skin resistance) of this person's body is 2000 ohms, the current will be $(I = \frac{E}{R}) \frac{110}{3000} = .037$ ampere, and the voltage across the person's body will be $(E = IR) .037 \times 2000 = 74$ volts.

However, with an installation having 1000 ohms ground resistance, on a 7200/220-110 volt system if a fault should occur between the transformer primary and secondary, the entire primary voltage could be impressed upon the secondary, and, as the fault current would be less than 7.2 amperes, the primary breaker might not trip. This would be a severe shock hazard, and might cause insulation breakdown. Also, if a lightning discharge with a current of 10,000 amperes were to contact the electrical equipment connected to the transformer secondary, the voltage, if insulation would permit, could build up to 10,000,000 volts. The result would be a discharge at the transformer, and also, one or more discharges would be probable between wiring, and plumbing, within the building served.

In actual practice, because ground points in the system are bonded together, secondary voltage to ground is 110. Therefore, the voltage across the person's body would be about 110 volts and, if we assume a total body resistance of 2000 ohms, the current

will be $\frac{110}{2000} = .055$ ampere. Many authorities consider that a current of .050 ampere, passing through the human body, is the approximate lower limit of current likely to cause fatalities.—S.W.

ANSWER TO D 25—The problem involves simple applications of Ohm's law, but the most essential information is missing—that of the person's body resistance.

The body resistance varies considerably from person to person. Likewise the condition of the point of contact—moist skin or heavy dry calluses—has an important effect. The blood stream, nerve tracts, and other body tissues are fairly good conductors as compared to the skin.

If it can be assumed that thirty thousand ohms will cover body and skin resistance, as well as contact resistance of, say, hands and feet, to

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Use Nepconol Type UF for both exposed and concealed work in dry, wet or corrosive locations; for installation inside masonry block or wall tiles; for imbedding, when suitably protected, in plaster and shallow chase masonry.

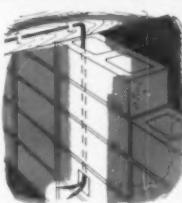
Note: Also recognized for use as Type NMC (non-metallic sheathed cable, corrosive resistant) National Electric Type UF Cable has been listed by Underwriters' Laboratories, Inc., and is provided for in the 1953 National Electrical Code.



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gether with any intervening clothing, the total resistance of the circuit described would be 31,000 ohms. Line and ground resistance is here neglected as unimportant.

110 volts divided by 31,000 ohms gives 0.0036 amperes flowing in the circuit. 0.0036 amperes times 30,000 ohms gives 108 volts across the points of contact.—L.E.B.

Difference of Opinion

Several readers have written in their objections to the answer to question N24, Page 149, January 1954 issue, on the operation of 25 cycle transformers at 60 cycles. To clarify the discussion, we present below the original question and answer and the comments made by other readers.

Question N24—What can I expect in efficiency and voltage regulation using 3-100 kva 25 cycle 6900v primary 440 volt secondary when I use them on a 60 cycle service, same primary and secondary voltage at one-third, two-thirds and full load?

There seems to be quite a difference of opinion on this subject. I would appreciate some definite figures if possible.—W.H.B.

Answer to N24—Generally, in transformers wound for a standard frequency. An increase in frequency results in an increase in regulation and an increase in inefficiency. This is so because transformer reactance increases directly with frequency, and eddy current and hysteresis losses increase when frequency increases. An increase from 25 cycles to 60 would increase regulation by 200% at full load, and the above mentioned losses would increase about 300% at no load. Therefore, the temperature of the transformers at no load would probably exceed the operating temperature of the transformers. With any load these transformers would probably burn up!—B.E.J.

Comments by others:—

"I have always thought that transformers can be used at higher frequency all right, but not at lower frequency.

"Reactance is a function of the geometrical construction of the coil and core and the frequency; and therefore the increase in frequency will increase the reactance.

"But as to the efficiency—that is a different story. Granted there will be some additional copper loss due to stray currents and eddy currents thru the conductors, this should not be very much. In the small size mentioned, I

doubt if the increase in copper loss will be much more than 5 to 10%. And as to the iron loss, the good books say something considerably different than B.E.J.

"The iron loss is composed of two items, hysteresis and eddy currents. The formula is $W_s = K f b^{1.8}$ and $W_e = K f^2 b^2$. Now the main point is that the applied voltage is related to the flux density thru the formula $b = k/f$. (Note that each of the k constants is different provided the coil remains the same, and the applied voltage remains the same.) In other words, by increasing the frequency we increase the cycles of loss, but owing to the decrease in maximum flux density, we decrease the energy loss per cycle. Depending upon the ratio of hysteresis to iron eddy current losses, therefore, the relative change in no-load loss will appear larger or smaller.

"I would therefore say that if the transformers worked on 25 cps and if the increase in reactance can be allowed, then the transformers will work all right on 60 cps, but with, say, 5% to 10% more no-load losses, and possibly a 10% overall increase in temperature when the transformer is operated at full load. —H.H.S."

"The reply given by B.E.J. is somewhat misleading. A prominent transformer designer gives a summary of constants when a transformer designed for operation at 25 cycles is connected to a 60 cycle circuit. The characteristics at 25 cycles are multiplied by factors as follows:

Characteristic	Multiplying Factor
Core Loss	0.55 approx
Exciting Current	0.15 approx
$I^2 R$	1.0
Eddy Current Loss	5.76
Per Cent Reactance	2.4

"It is clear that a transformer designed for operation at 25 cycles will have a core of greater cross-section than one designed for 60 cycles. The

formula $E = \frac{4.44 \times f \times s \phi}{108}$ where f is

frequency, and s the primary turns shows at once that for the same voltage E the product of f times ϕ (total core flux) must be the same, hence when f is increased from 25 to 60, or 2.4 times, the flux ϕ is reduced approximately in the same proportion and the 'temperature of the transformers at no load . . . will certainly not exceed the operating temperature' with a core loss of approximately 55% which in turn offsets the increase in the eddy current loss.

"To conclude, the writer in his experience has never had any failures for such a change in operating conditions.—C.O.D."

Can You ANSWER these QUESTIONS

QUESTION R25—We consistently experience trouble from our two insulation resistance testers on high voltage work, 2400-volt and over. We have two different makes, and both units produce a 500 volt dc signal through practically identical megohm meters. On lower voltage, 110 to 480 volts, tests are conclusive. However, on high voltage, we secure "good" readings, place the equipment in service and it will invariably "go to ground."

Do any readers have experience along these lines, and what has been their solution?—L.W.F.

QUESTION S25—We have a $\frac{1}{2}$ -hp capacitor-start 115-volt single phase motor that is used to operate a small air compressor. The motor has a hard time starting the compressor but once it comes up to speed it works fine. Can we change the condenser to increase the starting torque without harming the motor, and if so, how?—H.G.C.

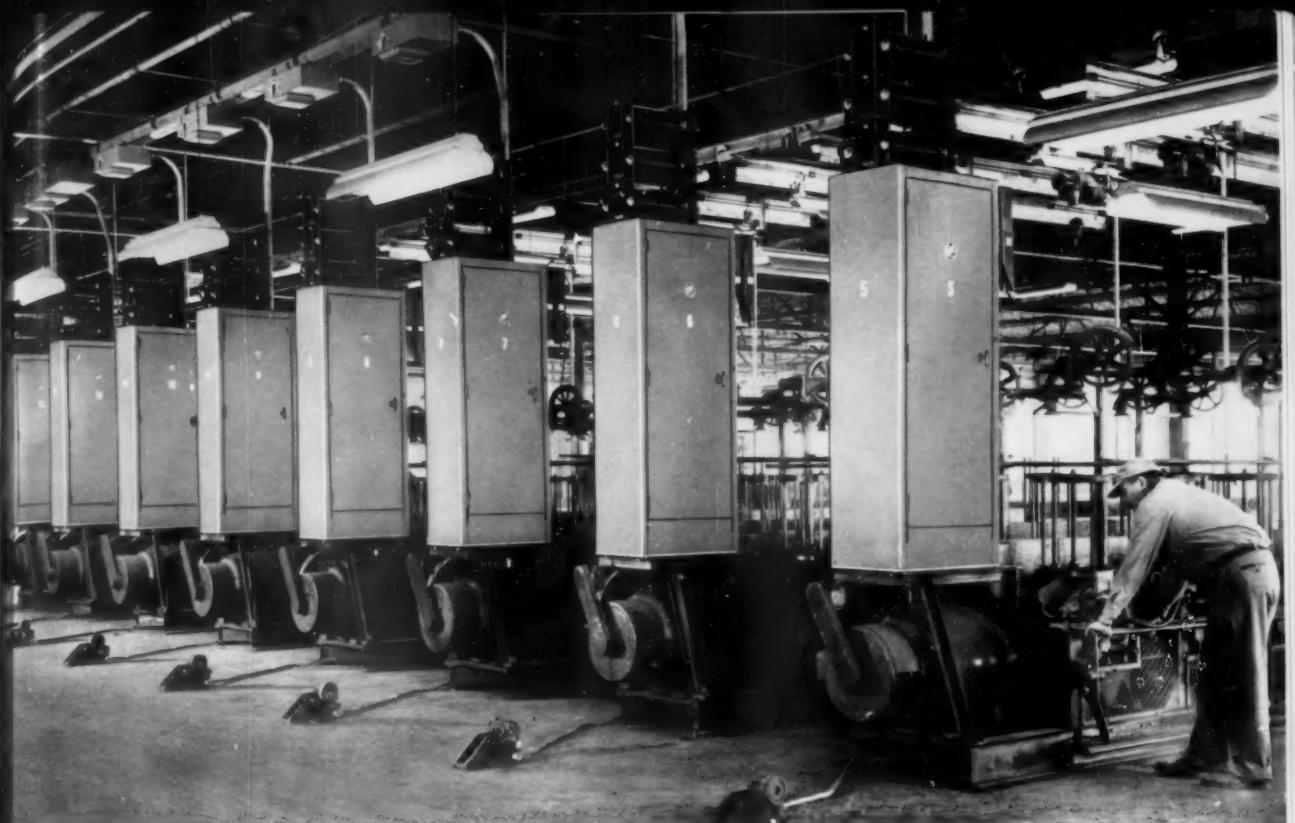
QUESTION T25—I was told that an explosion would occur if the ignition should fail before the boiler parts cooled on a gun type oil burner installation. Will the stack switch protect against this type of explosion?—H.S.

QUESTION U25—On Leland explosion-proof gasoline pump motors, the armature winding has jumpers across the commutator, which makes it show up on the growler test as a shorted winding. How would one know if this type of winding is used on other makes of motors being checked?—E.H.

QUESTION V25—I am installing a 100 amp service on a yard pole. When installing a service and panel inside, the Code calls for them hung bonded. Would a ground electrode at the panel and at the outside service serve the same purpose?—L.R.L.

QUESTION W25—Is there any possible way of using some combination of transformers and condensers to satisfactorily operate three phase motors from a single phase source?—H.G.C.

PLEASE SEND IN
YOUR ANSWERS BY APRIL 15



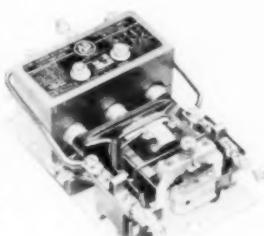
Eight Allen-Bradley Bulletin 761 100 hp automatic slip ring motor starters on wire drawing machines in Kansas City plant of Union Wire Rope Company. A total of 14 — 100 hp 4-point starters, 2 — 50 hp 4-point starters, and 2 — 50 hp 3-point starters are included in this installation.

100 HP Solenoid Operated SLIP RING MOTOR STARTERS

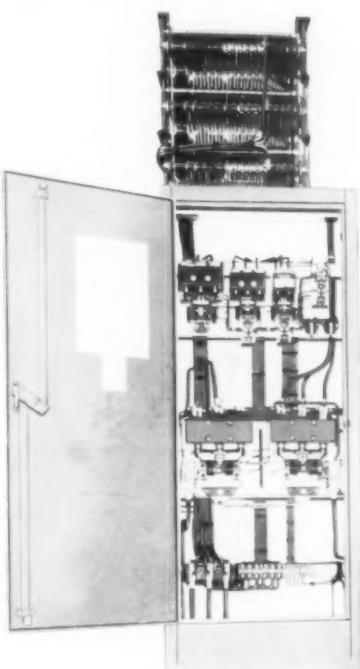
provide trouble free control for wire drawing machines

The accelerating contactors and the magnetic switches in these Allen-Bradley Bulletin 761 Slip Ring Motor Starters are simple, solenoid operated units. There is only one moving part . . . the one-piece solenoid plunger with double break, silver alloy contacts. Such simplicity assures long, trouble free life. The silver alloy contacts require no maintenance.

In this installation the grid type accelerating resistors are mounted above the starter cabinets. Timing relays on starter panel govern rate of acceleration. The operator merely pushes the START button . . . and the Bulletin 761 starter goes through the complete starting cycle automatically. When you have a tough control problem, consult Allen-Bradley.



Basic unit is the A-B solenoid starter with overload relays.

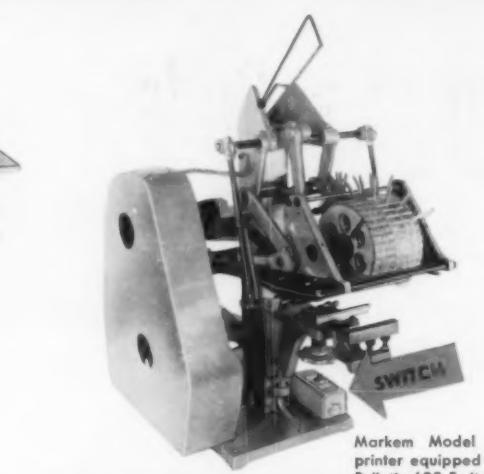


Bulletin 761 automatic slip ring motor starter (100 hp) with cabinet open to show panel of solenoid contactors, starters, and timing relays.

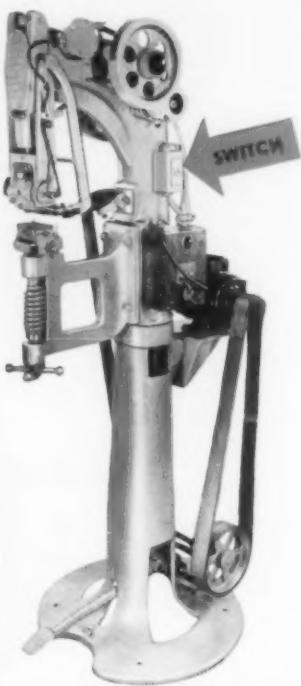




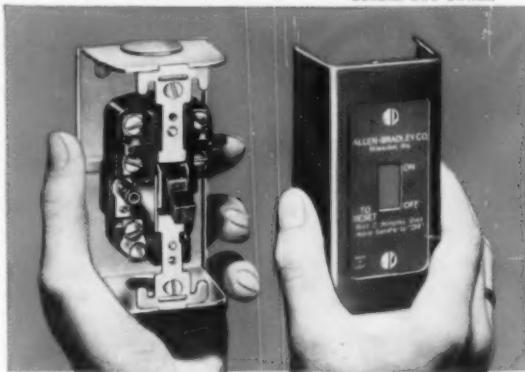
Markem Model 105 heavy duty box and label printer equipped with an A-B Bulletin 600 Manual Starting Switch.



Markem Model 45AC printer equipped with a Bulletin 600 Switch.



Markem No. 2 embosser for indenting and coloring on plastics, wood, leather, etc., with A-B Bulletin 600 Switch.



SNAP SWITCH with OVERLOAD BREAKER FOR 1 HP MOTORS AND SMALLER

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It has a built-in thermal overload breaker which trips the toggle switch in case the motor is overloaded... and you can't keep the switch closed until the overload on the motor is cleared.

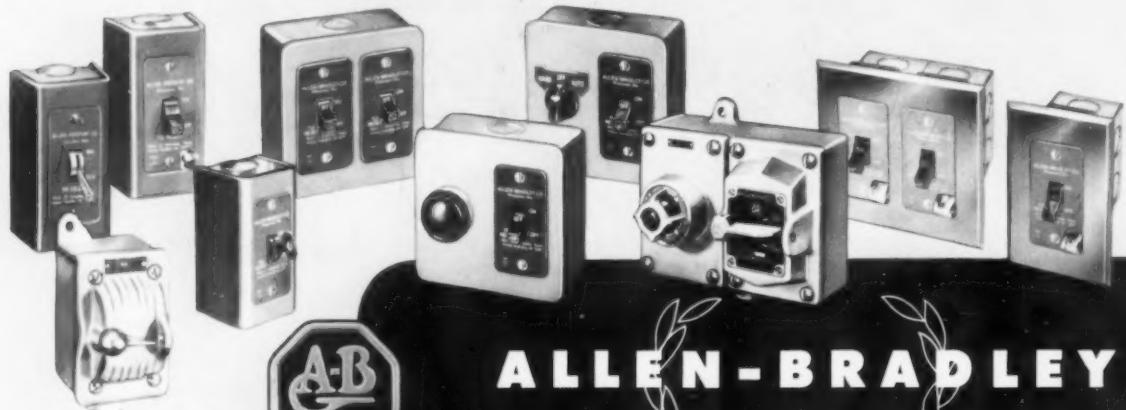
The Bulletin 600 Manual Starting Switch is ideal for small a-c and d-c motors on space heaters, stokers, refrigeration compressors, fans, pumps, packaging ma-

chines, labelers, grinders, and other light machinery.

Available in open type construction and also in standard sheet metal enclosures, waterproof and weatherproof enclosures, and gastight enclosures for installations in hazardous gas locations.

Bulletin 600 Manual Starting Switches can be furnished in various auxiliary combinations—namely, with pilot lights, selector switches, and key and lever switches, as illustrated below. They will fit into standard conduit switch boxes if desired. The double break, silver alloy contacts need no attention. Bulletin 600 gives dimensions and other data.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.



A few examples of the variety of enclosure combinations in the Bulletin 600 Manual Starting Switch line.

ALLEN-BRADLEY
BULLETIN 600 STARTING SWITCHES
QUALITY

Questions on the Code

Answered by

B. A. McDONALD, New York Board of Fire Underwriters, Rochester, N. Y.

GLENN ROWELL, Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.

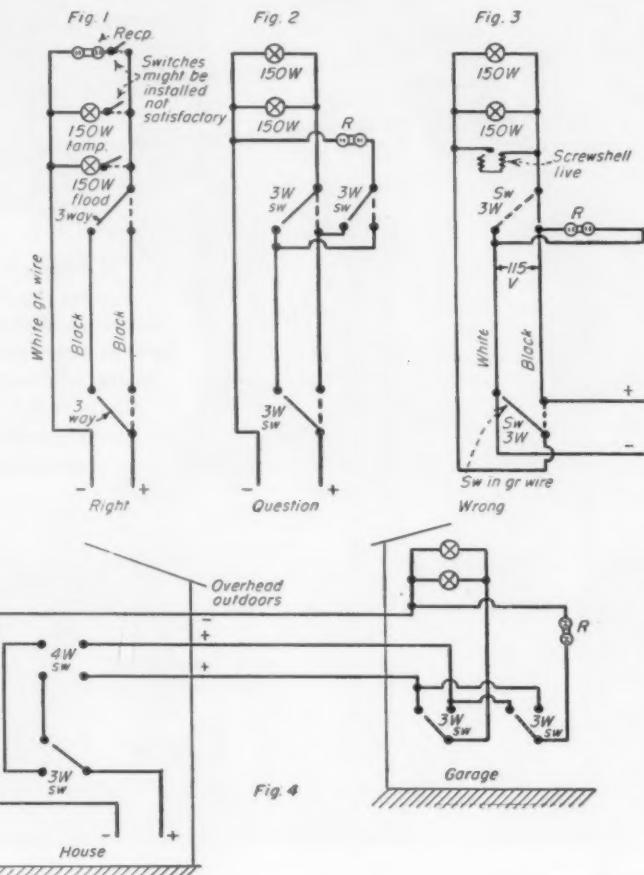
B. Z. SEGALL, Consulting Electrical Engineer, New Orleans, La.

Three-Way Switches

Q. At the present time I have a set of 3-way switches which control a light in the garage and a floodlight on the outside wall of the garage. I now wish to install a receptacle in the garage, independent of the 3-way switches, without running an extra wire overhead. I am told that this may be done by changing the connections at the three way switches but that the inspector may criticize same as a Code violation. Will you kindly explain to me the rules involved, and if it would be possible to install the receptacle so that it could be used independent of the lights? I would also like to install a third switch in my bedroom so that the lights could be controlled from that point.—E.T.H.

A. In order to clarify my answer I have shown through Fig. 1 the 3-way circuit, as I understand it now exists, and have added the new receptacle you wish to install. In this case, Section 3802 of the Code, which prohibits switching in the grounded conductor, is satisfied as well as the requirements of Section 2004, which requires the grounded conductor to be connected to the screw-shell of the lampholder. In this case the total load is served through the 3-way switches but individual control of each outlet could be obtained by adding single pole switches as shown. This procedure, however, is questionable since the operation of the lights in the garage from the switch in the house would be influenced by the position of the single pole switches. If they were not in the closed position you would lose the effect desired by the installation of the 3-way switches. It therefore appears to me that such a method of solving your problem is not practicable.

I have shown in Fig. 2 how the additional receptacle might be connected by the use of an additional 3-way switch in the garage. This method would permit the receptacle to be controlled independent of the lights and therefore could be used whether the lights were on or off. Such procedure would not violate the

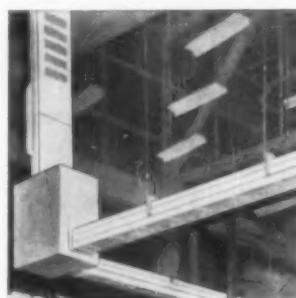
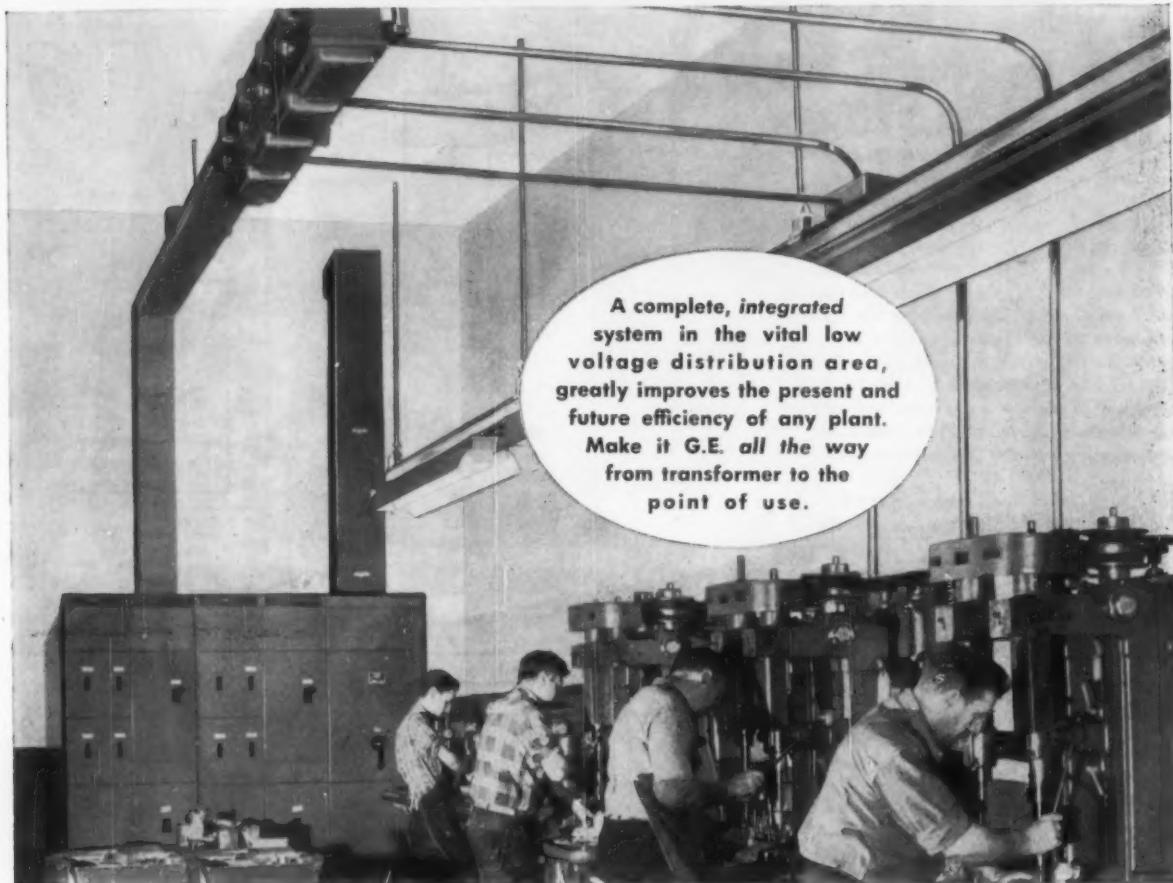


requirements of Sections 2004 or 3802 but there is a point which must be checked. This concerns the ampere rating of the switch. Underwriters Laboratories permit 3-way and 4-way switches to be rated as low as 3 amperes at 125 volts. In your case, the load served through one of the 3-way switches could be a 150-watt projector floodlight and a 150-watt bulb for the garage, plus the unknown variable load connected to the receptacle. If the 3-way switch serving such a load was rated at only 3 amperes or possibly 5 amperes, it appears that the requirements of Section 3814 covering the rating of snap switches would be violated. If, however, 10 ampere Type T switches were used, it appears to me that no violation would be involved,

provided the receptacle was not used to serve some heavy inductive load.

Your proposal to reconnect the 3-way switches so that the receptacle would be entirely independent of the 3-way switches, apparently involves the use of connecting both wires of the circuit to the switch terminals. I have shown this circuit in Fig. 3. This procedure violates Section 3802 of the Code, which definitely prohibits a 3-way or a 4-way switch to disconnect the grounded conductor. It is evident from the diagram that both 3-way switches may have the switch in the grounded circuit conductor. This procedure also violates Section 2004 of the Code which requires the grounded conductor to be connected to the screw-shell of the circuit. I believe it is

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evident from the drawing that the screw-shell will be either live or at ground potential depending upon the position of the switch. Inspectors may readily check this point by the use of a small battery test set or a 125-volt tester. It also follows that 3-way switches are not designed for the connection of both polarities and when so used, short circuits may result when the switch fails.

In view of the foregoing, it appears that you may solve your immediate problem by the use of the additional 3-way switch as shown in Fig. 2 provided that particular attention is given the rating of the switch as already outlined.

The additional control desired may be obtained in the bedroom by connecting a 4-way switch in the "go-between wires" running between the two 3-way switches. Such a connection may be made at the 3-way switch in the house or at the overhead wires near the point of connection to the building. I believe Fig. 4 clarifies this point.—B.A.McD.

High Voltage Fluorescent Lighting

Q. Can an office building be lighted with fluorescent lights 277/480 volts and have switching at each room and comply with the code rules? Using remote control switching 24 volts?

If the answer can be yes, what precautions must be used, like grounding and switching? The code says you can't ground over 150 volts to ground. If the voltage is over 150 volts conduit must be bonded. Would the conduit and wires for 24-volt switching be separate from 277/480 volts? Under 50 volts does not have to be grounded. These solenoid relays that a large company puts out are marked 3 amperes capacity. What does this mean on the 24 volt side?

Does the new code cover high voltage lighting and low voltage switching which seems to be the coming thing in lighting?—E.E.P.

A. The 1951 Code only permitted the high voltage fluorescent lighting in "industrial occupancies", see Section 2113. The 1953 Code permits these installations also in

- a. office buildings,
- b. large schools, and
- c. large stores.

Both the 1951 and 1953 Code set up definite standards for construction, i.e.,

- a. fixtures must be permanently installed,
- b. fixtures must be mounted at least eight feet from the floor,

c. manual switching cannot be an integral part of the fixture, and

d. branch circuits supply only the ballasts for those electric discharge lamps which exceed 150 volts to ground but do not exceed 300 volts to ground.

The Code does not specifically state you can't ground "over 150 volts to ground". Section 2514 in the fine print note recommends grounding if voltage exceeds 150 volts to ground. Section 2542 requires grounding of exposed non-current carrying metal parts of fixed equipment if the equipment operates with any terminal at more than 150 volts to ground, except,

1. switch and circuit breaker enclosures accessible to qualified persons, only,

2. electrically heated device metal frames which are permanently and effectively insulated from ground and which are exempted by special permission of the local code enforcing authority, and

3. transformers mounted on wooden poles at a height of 8 feet or more from the ground.

You can use the remote control systems such as those manufactured by the General Electric Co, the Square D Co and the Touchplate Co. As a rule these low voltage wires are not placed in conduit, but in some cases they may have to be so installed to facilitate their installation. Yes, the two systems must be kept separated.

The 3 ampere rating usually refers to the control switch contact rating. In other words the control switch for operation of the relay is usually rated 3 amperes, 24 volts. The relays are usually rated 15 amperes, 120 or 277 volts.

However, there are now available panelboards with branch circuit breakers rated for operation on 277/480 volts. Also flush toggle switches are available for use on such systems. So that the switching and control of these higher voltage fluorescent systems may be designed to use the conventional direct switching systems now used for the lower voltage systems.—B.Z.S.

Service Conductors

Q. A housing project is being erected in our city consisting of a row of houses having six dwelling units in each building. The electrical plans and specifications call for a single service drop to one of the rear corners of each of these row houses, with the service drop carried along the outside of the rear of the building and tapped into each of the six units with 60-amp service switches located in the base-

ment of each of the six dwellings. Is it not necessary to place a single disconnecting switch on this service drop which will disconnect all of the buildings at one time inasmuch as the six subdivisions are not located in a common location?—L.H.

A. Under Section 2301 you will note in paragraph b that buildings of multiple occupancy may have two or more separate sets of service-entrance conductors which are tapped from one service drop or two or more sub-sets of service-entrance conductors may be tapped from a single set of main service conductors. You will also note reference made to Sections 2351 and 2371. Then the last sentence of paragraph 4 under Section 2371 a. reads as follows: "Multiple occupancy buildings that do not have individual occupancy above the second floor may have service conductors run to each occupancy in accordance with 2301-b, and each such service may have not more than six circuit breakers or six sets of fuses." This same provision is also included under paragraph b. following Section 2351. Therefore, inasmuch as no provision is made in the Code which would require a main disconnect ahead, an installation made without such a main line switch would not be in violation of Code requirements.—G.R.

Residential Garages

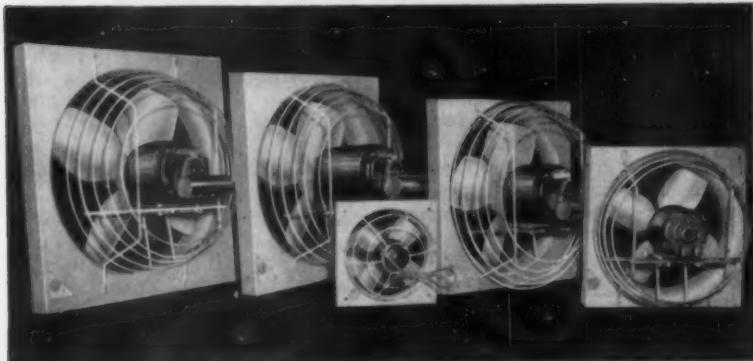
Q. My garage is attached to my home. The floor level of the garage is 12 inches below the first floor level of the house and there is a door leading from the garage to the house. The garage floor is at adjacent ground level. Would such a combination be in violation of the new garage rules? Would the first floor of my house be considered a hazardous location?—J.W.

A. According to Section 5110-b, if your garage floor is at adjacent ground level and if it has one outside door, the garage is not considered a hazardous location. Since every garage must have a door of sufficient size to permit the entrance of an automobile, it appears to me that the outside door referred to in this rule would be an extra door of a size to afford ordinary entrance by people. If your garage does not have this outside door, it would be classed as a hazardous area up to a level of 18 inches above the garage floor.

Section 5110-c covers a condition where the garage floor is below ground or driveway level and this rule ap-

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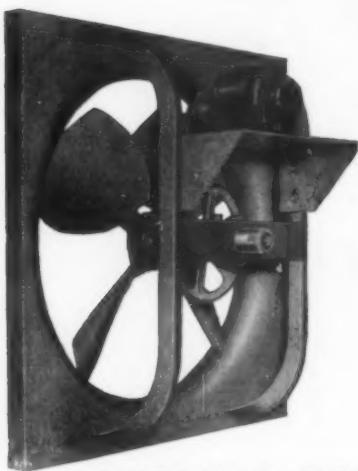


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parently does not apply since your garage floor is at ground level.

In view of the foregoing comment, it appears to me, in the event that you do not have the extra door, that your garage is a hazardous location and that the question tapers to the point where a decision hinges on the question of a suitable cutoff between the house and the garage. If the door leading to the house is close fitting and equipped with a spring or other self closing device, it might be considered a cutoff under the conditions outlined and the house would not be a hazardous location. I also believe if the house floor was 18 inches above the garage floor that there would be no question as to the status of the house since it would be outside the hazardous area.—B.A.McD.

Wiring for Dry Cleaning Room

Q. Our tailor is expanding his business to include a dry cleaning machine and is therefore building a sizable addition to his building. He has purchased a dry cleaning unit known as a 140 F. Hoffman unit and has asked me to wire the new addition. What type of wiring method should I use in this dry cleaning section?—B.H.

A. The Hoffman 140 F. dry cleaning machine is listed by the Underwriters' Laboratories for use with dry cleaning solvents having a flash point of 138.2 degrees Fahrenheit. Therefore, if this dry cleaner will use only the listed solvents commonly known as 140 F. solvents in this listed dry cleaning machine, you may wire the room, containing the machine, with any of the wiring methods approved by the National Electrical Code. If, on the other hand, this operator will not agree to use only the listed 140 F. solvent, it will be necessary for you to treat this area as a Class I, Group D location and wire it as provided under Article 500 of the National Electrical Code.—G.R.

Flexible Metal Conduit In Wet Locations

Q. Can flexible metal conduit be used in wet locations?—R.G.

A. Yes. Section 3502 states "Flexible metal conduit shall not be used in (1) wet locations, unless conductors are of the lead covered type or of other type specifically approved for

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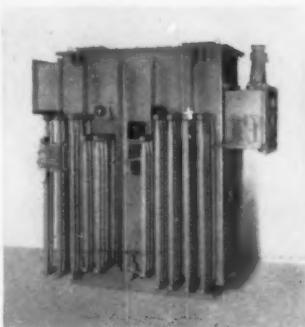
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the conditions; . . ." Therefore, with lead covered cables, Types RW, RHW, RH-RW, RUW, TW, UF and USE insulated wires we may install the "Greenfield" in wet locations, i.e., underground, exposed to weather, etc.

The other prohibitions stated in Section 3502, however, would still supersede this permission. Thus, the rubber covered conductors may be exposed to materials which would attack the rubber, i.e., oil, gasoline, etc. Under these conditions, only the lead covered or the TW or the special General Electrical Co. "Nylon" jacketed Type TW wires may be installed in the "Greenfield".—B.Z.S.

Insulating Bushings

Q. When using insulating bushings on conduit terminals, does the Code require the use of two lock-nuts in all cases in addition to the bushing? Does the second sentence of 3736 b refer only to No. 4 or larger conductors?—G.J.H.

A. It is my opinion that the second sentence of Section 3736 b requires double lock-nuts to be used when conduit bushings, constructed wholly of insulating material, are used irrespective of the size of the conduit or wire. Section 3736 covers in general the deflection of conductors entering or leaving cabinets or cutout boxes and the like. The first sentence covered by paragraph b concerns conductors No. 4 or larger and requires the use of insulating bushings when such conductors enter a raceway in a cabinet, pull box, junction box or auxiliary gutter. The second sentence of this paragraph is a general requirement that double lock-nuts be used when conduit bushings are constructed wholly of insulating material, and this provision covers any size wire or conduit. Back in 1947 Official Interpretation No. 284 was issued on January 22, which I believe fully verifies this opinion. It reads as follows:

"Q. Was it the intent of the Electrical Committee that the last sentence of paragraph b of Section 3786 of the 1947 edition of the Code applies to any bushing constructed wholly of insulating material employed, as provided in Section 3468?"

"FINDING: YES."

Since the second sentence of this rule has not been changed since 1947, it appears definite that the Interpretation retains its status in the 1953 Code. The Underwriters Laboratories in their Electrical Equipment List for the year 1953, page 248 also appears to recognize this interpretation of this rule.—B.A.McD.



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Some 107 miles of neoprene-jacketed wire and cable serve the Fairless Works in a number of ways. Power distribution, for example, is handled by underground cables jacketed with neoprene over lead. Here again, neoprene's resistance to soil acids and



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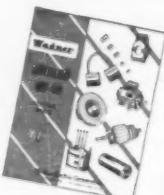
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Bonding Jumpers

Q. I have extended a feeder nearly 200 feet to a room in an industrial plant where rubber is being applied on a fabric, making it necessary to treat all wiring within the room itself as a Class I location. The feeder extending from the distribution cabinet to this room is run in rigid conduit and has three pull boxes installed in its length. The inspector now claims that I must place bonding jumpers in this conduit around these pull boxes, even though they are not located in a hazardous location. Is this required by the Code?—E.A.S.

A. Section 5026 states under paragraph b. that locknut and bushing shall not be depended upon for bonding purposes but that bonding jumpers with proper fittings or other approved means shall be used. Then under paragraph d. of this same section, you will note that wiring in a Class I location when supplied from a grounded alternating current supply system shall have the grounded service conductor bonded to the raceway system and the bonding connection must be made on the supply side of the service disconnecting means. Then under paragraph a., you will note the requirement the grounding shall be provided as specified in Article 250 of this code, which requires that all grounded continuity be continuous back to the point where the grounded service conductor is bonded to the service equipment.

Because of these rules, it is my opinion that the inspector is correct in insisting upon the bonding jumpers around the pull boxes and anywhere else on this conduit feeder run where locknuts and bushings or double lock-nuts are used to secure the conduit to boxes and cabinets.—G.R.

HP Rating of Switches

Q. A 60-ampere, 3-pole, 250-volt fused switch is rated 15 hp. Can we use this switch with dummy fuses and get the same hp rating? —E.McK.

A. In my opinion, the use of the dummy fuses would in no way effect the hp rating of the switch. I am assuming all you would do would be to place copper tubing of diameters comparable to the fuse diameters, so that you would in no manner alter the physical make up of the switch.

The hp rating is built into the switch by proper design of the switch. The non-use of fuses in the switch in no way alters this fact.—B.Z.S.

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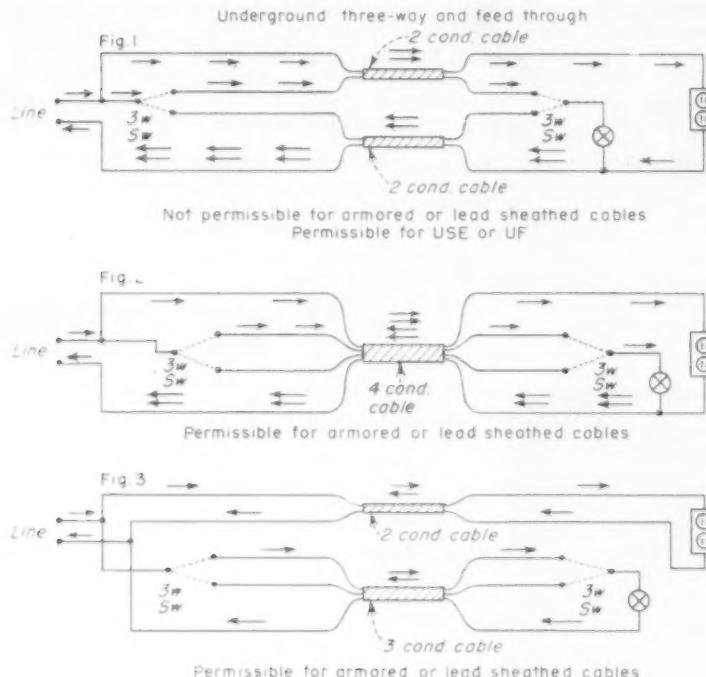
Q. I am wiring a new garage on a farm with the lights controlled by 3-way switches, one in the house and one in the garage. I also wish to install a receptacle in the garage independent of the 3-way switches. The wires between the buildings will be run underground and I plan to use armored cable lead. I am told, however, that more wires will be required than would be needed if nonmetallic cable were used. The run is long and I don't wish to make any mistake. Kindly explain the difference and the Code rules involved.—E.T.H.

A. Section 3802 of the Code and also Section 3018 requires, when metal enclosures are used, to run both polarities in the same enclosure. In the case cited, if you wish to use armored cable lead you would have to use either a four conductor cable or one 2 conductor and one 3 conductor cable, if the above rule is to be satisfied. You could not use two 2-wire metallic cables since there is no way to avoid a circuit which would require the current to flow through a conductor in one cable and return through a conductor in the other cable. When the polarities are so separated, the inductive effect is not neutralized as it is when the conductors of the circuit are in one enclosure. As a result, the cable armor will become overheated by induction. In order to clarify this point, I have shown in Fig. 1 the condition which results when

two 2-wire armored cables are used. I am also showing through Fig. 2 how one 2-wire and one 3-wire cable will eliminate the inductive heating. Fig. 3 shows how two 2-wire nonmetallic cables, such as Type USE or the new Type UF cable could be used to do the same job with only 4 conductors and without any inductive heating, since such cables do not have a metal armor surrounding the conductors. It therefore follows, in order to comply with the Code and use armored cable lead, that either a 4-wire cable or a combination of one 2-wire and one 3-wire cable must be used.—B.A.McD.

Switch Control Fluorescent Fixtures

Q. Section 2113 of the new 1953 Code permits fluorescent fixtures in industrial establishments to be connected to branch circuits operating at 300 volts to ground provided there is no switch control as an integral part of the fixture. The same rule also recognizes a fluorescent fixture in industrial establishments, office buildings, large schools and stores to be connected to branch circuits operating at 300 volts to ground provided there is no manual switch control as an integral part of the fixture. Do these provisions infer that relay switching integral with the fixture such as made by General Electric could not be used in the first case but could be used in the second case?—E.T.H.



A. It is my opinion that there is a definite distinction between the two exceptions which are covered by 1 and 2 of Section 2113. In the first exception no switch of any type integral with the fixture could be used, while exception 2 would recognize relay switching such as you describe to be an integral part of the fixture. A review of both exceptions shows, in the first case, that the exception applies not only to fluorescent lampholders but also to mogul-base screw-shell lampholders; while in the second case, the exception applies only to branch circuits which supply the ballasts for electric discharge lamps in permanently installed fixtures. In the first case, we have the additional hazard of the screw-shell type of lampholder with exposed live contacts to contend with and the portable connection through a receptacle. In the second case, the screw-shell lampholders are not recognized for use and the fixture must be connected permanently without resort to a cord and receptacle. It therefore appears to me that the distinction between the conditions covered by the exceptions warrants the provisions.—B.A.McD.

Metal Lighting Fixtures

Q. If metal fixtures are used in the amusement room located in the basement of a dwelling, may I connect them to a conventional two conductor nonmetallic sheathed cable circuit or must I use a third wire to ground such fixtures?—M.C.

A. Section 4215 of the National Electrical Code reads as follows: "Ungrounded metal lighting fixtures, lampholders and face plates shall not be installed in contact with conducting surfaces nor within 8 feet vertically or 5 feet horizontally of laundry tubs, bathtubs, shower baths, plumbing fixtures, steam pipes or other grounded metal work or grounded surfaces. Metal pull chains used at these locations shall be provided with insulating links."

Concrete floors laid directly on ground or earth are considered as grounded surfaces and therefore if the ungrounded metal lighting fixtures are located within 8 feet vertically of this floor, they would be in violation of this section making it necessary for you to use a three conductor circuit with the third wire used for the grounding of the fixtures by being attached both to the fixture housing and to the neutral terminal bar in the service equipment.—G.R.



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for UNINTERRUPTED POWER FLOW

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Contacts are double wiping type in all receptacles, and are made of heavy gauge phosphor bronze; extra large terminal screws and ample wiring room provided; quality controlled mass production assures accurate alignment of blades.

Send for bulletin LL



LEV-O-LOCK devices are available in 2-3-4 wire caps, connectors and receptacles in 10 and 20 Amp ratings. Approved by Underwriters' Laboratories.

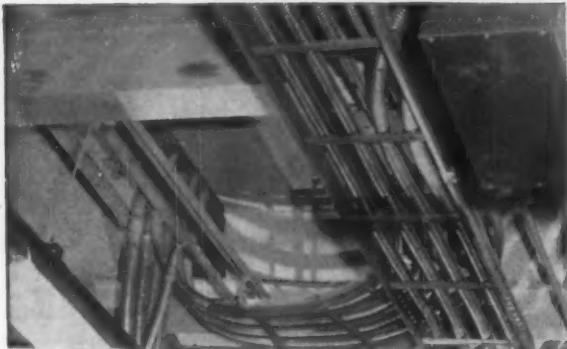


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Here's why a General Electric V-c interlocked armor cable system is...

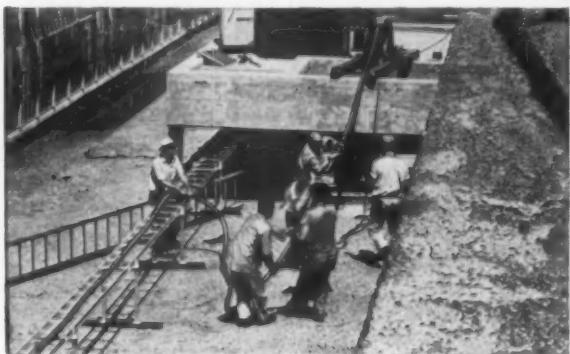
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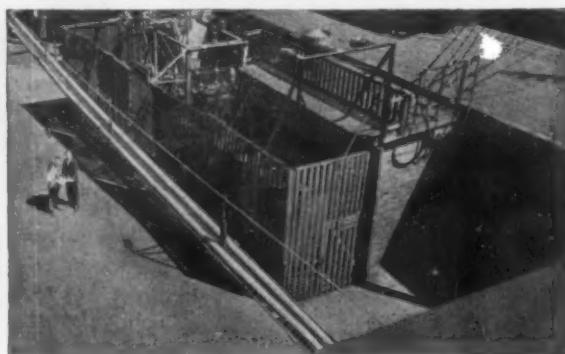
1 CORNERS ARE NO PROBLEM. Flexible V-c interlocked armor cable can be run easily around corners and over beams. This reduces layout and prefitting time—in many instances single line layout diagrams are sufficient. These advantages often cut layout and installation time in half.



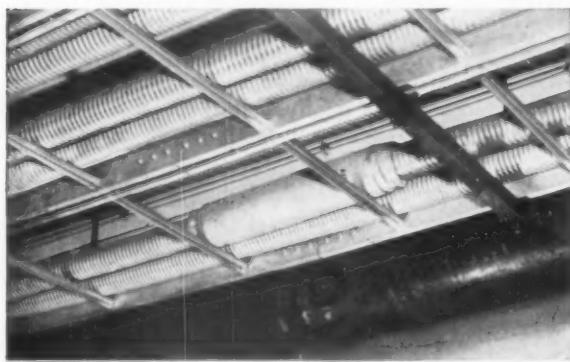
2 LONG, UNBROKEN RUNS. You can install V-c interlocked armor cable in long, unbroken runs and thus keep splicing to a minimum. Many cables can be installed on one rack or basket. The small over-all cross section of interlocked armor cable lets you take advantage of cramped areas.



3 LIGHTER WEIGHT. G-E V-c interlocked armor cable weighs only about a third as much as a conventional cable and conduit installation. This light weight means easy handling. Also, the cable can be installed indoors or outdoors without special protection.



4 FEWER CABLES. These two interlocked armor cables take the place of the many low-voltage cables at the right. Fewer cables, plus simple messenger or rack support, give you further reductions in installation time.



5 SPLICING AND TERMINATION ARE EASY. Splicing is a simple mechanical job—easily done by electricians on the site. High-voltage cables can be terminated indoors with a junction box—without potheads. And a G-E V-c interlocked armor cable system is always accessible for alterations or additions.

You can reduce material handling and installation time by using a General Electric V-c interlocked armor cable system for primary and secondary feeders, and for connecting low-voltage plug-in bus and power utilization equipment. For more information see your G-E Construction Materials distributor, or write Section W119-318, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

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In The News

Maintenance Men Compare Methods at Chicago Conference

Round table discussions generate exchange of ideas and experience in preventive maintenance at the Fifth National Plant Maintenance and Engineering Conference and Show.

Intense interest in preventive maintenance of all types for industrial plants was evident last month when more than 2,000 engineers, maintenance supervisors, contractors and production personnel registered at the first session of the Fifth National Plant Maintenance and Engineering Conference at Chicago's Conrad Hilton Hotel. Additional emphasis was provided at the accompanying Show in the International Amphitheatre where approximately 400 manufacturers displayed products and services designed to increase plant operation and maintenance efficiency.

Conference subjects for the three-day meeting covered practically every phase of maintenance from lubrication to labor, from small plants to large industrial facilities. A total of 20 round table sessions, each held twice, and some 11 sectional conferences, many of them repeated, provided a broad sounding board for expression of individual views. In fact, as one moved from session to session, it became increasingly apparent that industrial production and maintenance departments are gaining equal status in the modern efficient plant. The success of the former depends upon the efficient operation of the latter.

In his "Summation of Maintenance Principles" at the opening session, George J. Martin, National Biscuit Co., New York, established a conference theme. "Anything that reduces maintenance efficiency, invariably increases depreciation and production costs. Plant production methods cannot be termed modern if the equipment is serviced by out-of-date methods. A well organized and efficiently operated maintenance department pays big dividends in any industry," he noted. Where planning and scheduling procedures have been installed, it has been found that 80% to 90% of all maintenance work can be properly planned and scheduled," he revealed. Martin suggested that scheduling be broken down as follows:

1. *Routine Work*—lubrication, area mechanics, cleaning, lamp replacements and similar chores.

2. *Preventive Maintenance Inspections*—made on an assignment schedule basis by area mechanics and occasionally from central shops.

3. *Routine Assigned Maintenance Work*—done on work order requests. Planned and scheduled a day or two in advance; assigned on priority basis.

4. *Periodic Equipment Overhaul*—planned six months to a year in advance based on preventive maintenance inspection reports. Includes such items as motors, pumps, compressors.

5. *Long Range Capital Improvements*—minor items fitted into maintenance schedules, major items usually contracted to outside companies.

6. *Emergency Repair Work*—given top priority over all other maintenance work when it occurs. Preventive maintenance substantially reduces this type of assignment.



PROPONENTS OF systematic preventive electrical maintenance (L to R) K. S. Person, Norton Co., Worcester, Mass., and electrical contractor J. W. Aldrich, Pat-chogue, Long Island, discuss techniques at Plant Maintenance Conference.



APPLICATION ENGINEER R. M. Ryan, General Electric Co., Chicago, makes a point while conducting open forum discussion on electrical distribution system maintenance.

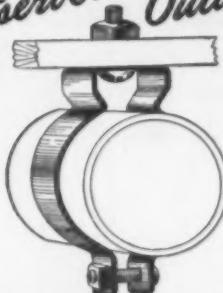
K. W. Pratt, mechanical superintendent, Titanium Division, National Lead Company, South Amboy, N. J., agrees with Martin that management and production personnel should know the "why" of maintenance department operation. In his discussion "Getting Management's O.K. on the Maintenance Program," Pratt listed two requisites: (1) Do the job; (2) Tell management about it. "The most effective way to sell the maintenance job is by everyday contact with associates 'across the line' and 'up the line'. A brief daily check and discussion should be held with the departments being serviced. Once they are convinced you are doing a good maintenance job, the battle is more than half won. They will sell maintenance to management for you," he stated. A sound maintenance program should be founded on economical long range costs. Divide maintenance into two classes: Uncontrollable (fluctuating labor costs, material costs, etc.); and Controllable (amount and kind of materials used, methods employed, overtime and work efficiency). Then reduce cost by improving methods and techniques, he urged.

There was no question that preventive maintenance is an accepted practice in industry. "Breakdown" or "Fix-It" maintenance is a thing of the

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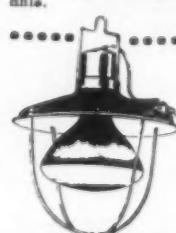
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250 chicks to maturity.
Raising brooder
3" weekly makes
more space avail-
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past. Interesting to electrical maintenance personnel, operating personnel and contractors are these experiences related by prominent plant supervisors at the conference.

A. B. Dick Co., Chicago—F. R. Malmgren, building superintendent, reported that he handles all problems on buildings, grounds and plant services. The master mechanic handles all production problems. The maintenance department is confined to maintenance only, installation of production equipment and alteration of equipment. Outside contractors are used for building changes and major installations. Both master mechanic and building superintendent work with management on new construction, collaborated with outside architects on plans and specifications, maintain strict supervision during construction and coordinate their efforts with the contractor and architect.

"Selection of a contractor is as important as the selection of an architect. Price alone cannot be the determining factor in obtaining a suitable building," Malmgren stated. Proper planning on new construction can save maintenance headaches, he added.

International Resistance Co., Philadelphia—W. C. Dooling, manager, methods and standards department, revealed that adaption of a work control system of preventive maintenance at IRC effected a savings of \$100,000 per year. Drastic reduction in overtime work, elimination of "fancy" and un-

necessary work and use of payroll men on new construction within the plant were responsible, he noted, adding that maintenance methods should receive the same attention as production methods.

Electro Metallurgical Co., division, Union Carbide and Carbon Co., Niagara Falls, N. Y.—O. W. Gravell, works engineer, noted that they now use 20% less hours on preventive maintenance than formerly used on "breakdown" maintenance. Emergencies now occur less than 5% of the time. Down time on electric furnaces has been reduced some 50% since the preventive maintenance program was instituted in 1947. Because of metallic dust in the atmosphere, some 5,000 induction motors have to be "blown out" each month at a monthly cost of about \$1,200. Maintenance men spend two to three days per week on inspection work, the rest on repairs. Maintenance department "tickler" sheets precede equipment overhauls by about 30 days.

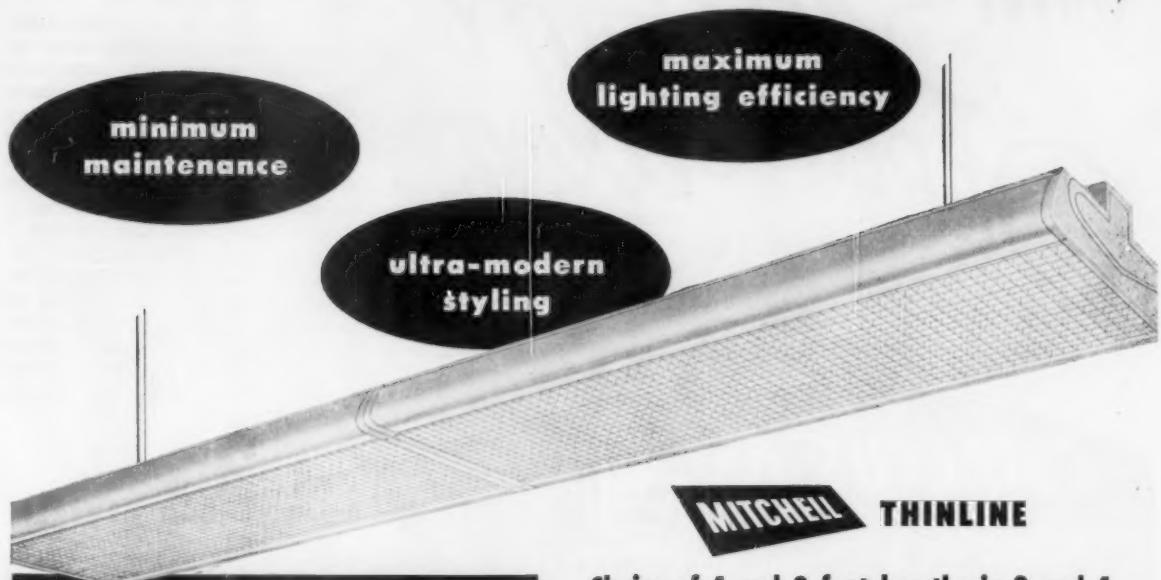
Of the 20 concurrent round table discussions, three dealt specifically with electrical maintenance problems, distribution systems, electronic control and lighting equipment.

Through a series of well-directed leading questions and comment, discussion leader R. M. Ryan, General Electric Co., Chicago, generated a healthy 2½ hour exchange of ideas on electric distribution system maintenance. More than 100 electrical supervisors packed the session, freely re-



SCHOOL LIGHTING experts took part in a one-day School Lighting Clinic in New York on January 28, 1954, sponsored by New York Section of the Illuminating Engineering Society. Speakers were (l to r): C. L. Crouch (standing), Technical Director, IES, who spoke on "Light and Vision" and "Classroom Surroundings"; Stanley McCandless, Century Lighting, Inc., and Yale University, who spoke on "Auditorium and Stage Lighting"; B. J. Greene, Consulting Engineer, who spoke on "Daylighting"; Carl J. Allen, General Electric Co., Nela Park, who spoke on "Classroom Lighting Equipment and Layout"; John J. Neidhart, Westinghouse Electric Corp., who spoke on "Library, Shop and Miscellaneous Lighting" and "Economic Factors"; and Douglas Haskell, Editorial Chairman, ARCHITECTURAL FORUM, who spoke on "Trends in School Architecture". The moderator for the program was H. E. D'Andrade, General Electric Co., New York, who also spoke on "Benefits of Good School Lighting". More than 100 lighting engineers and local school authorities attended this symposium.

ultra-shallow fluorescent luminaires from **MITCHELL**



The new ultra-shallow "Polaris" luminaire incorporates all the fine features described at right, with Penticore prismatic glass shielding delivering a light transmission factor of 85%, with excellent diffusing quality. The combination of high light output and the low surface brightness of the "Evenglo" sides and Penticore Glass shield creates ideal, harmonious lighting for the finest commercial interiors.



This is the new ultra-shallow luminaire designed to meet the requirements of large commercial installations where high-efficiency lighting and exceptional low cost are primary considerations. The luminaire features a V-spine design which provides a highly reflective surface to increase down-light intensity. The 8-foot units feature special "tandem" design (two 4-foot units with one 8-foot body channel) to save installation time and assure perfect alignment in continuous rows.

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Note the ultra-shallow contour. When flush-mounted, the luminaire presents a beautiful streamlined appearance.



Concealed combination hinge and latch on each side of luminaire permit easy removal of louver from either side.



New Rapid-Start units are available; they slash maintenance cost by eliminating expense of replacing starters.

"Evenglo" translucent extruded Polystyrene side panels provide desirable uniform low surface brightness.

Write for complete descriptive brochures describing the new MITCHELL Ultra-Shallow "Thinline," "Polaris" and "Modernizer" Luminaires

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transformers installed,
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This factor alone, plus an enviable record of trouble-free performance and matchless dependability made Marcus Dry Type Transformers the choice of the Beltzhoover Electric Co., of Cincinnati, Electrical Contractors for the project, and A. M. Kinney, Inc. the consulting Engineer on the job.

Increase your power Performance Standards with Marcus Dry Type Transformers.

**Capacities from
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- DISTRIBUTION
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ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY

lated their own experiences. About 60% of those present had high voltage systems, almost all multiple load-center substation distribution.

Hottest subject at the lighting maintenance forum was group lamp replacement versus life expectancy method. More plant men are gradually changing over to the group plan; many still date lamps and replace on basis of estimated life. Creation of an office environment in factory areas through use of upward component fixtures is gaining momentum. More attention is being given to ceiling and wall reflectance. Most of those present reported general lighting levels of 50 footcandles or better; 100 footcandles and up for inspection lighting. More attention is being directed to choice of lighting equipment for specific applications.

**Puckett Retires As
Atlanta NECA Manager**

After serving the Atlanta Chapter of NECA since April, 1935, W. Reid Puckett, secretary-manager, retired Feb. 1, and was succeeded by George L. Peterson of New Orleans, executive director of three trade associations in that city and editor of the Southern Plumbing and Heating Retailer.

Mr. Puckett, who has been in trade association work for 33 years, was honored at a dinner by industry leaders at which Don Clayton, national president of NECA, and Charles Thurber, NECA representative, were present.

The Atlanta Chapter is preparing a promotional campaign to sell the member contractor services to engineers, architects and builders. Promotion



W. REED PUCKETT, left, congratulates George L. Peterson of New Orleans, as his successor as secretary-manager of the Atlanta chapter of NECA. Mr. Puckett has been with the Atlanta chapter for the past 19 years and in association work for 33 years.

groundwork for the 1954-55 Electrical Prod



Spurred on by your acceptance and use of last September's GUIDE, the editors threw the switch on January 29th for next September's EPG.

January 29th was M-Day. The day questionnaires were mailed to more than 7,000 selected manufacturers asking them to list the products they make, and the trade names by which they and their products are known.

"Unnecessary work," some folks might say. "Why can't your editors use last year's information over again?" **CHANGES** is the only answer.

New products appear on the scene; new companies too.

Some companies move to new locations; some move out of business.

... MANY CHANGES

Most everyone who knows the electrical construction and maintenance business reckons that time is money. Which is why the editors are so insistent on accurate, up-to-date information for the EPG. They know that a wrong address or an incorrect listing could mean trouble - delay an estimate, or kill an order. They also realize there is no other *specifically electrical* product reference for electrical men. So they approach the job of preparing the EPG in the same serious manner that you use it and rely on it.

NOW LET'S EXAMINE SOME OF THE CHANGES, ADDITIONS, AND IMPROVEMENTS SLATED FOR THE 1954-55 EPG...WHICH YOU HAD A HAND IN MAKING.

Back in December (some of you will recall), we conducted a survey to determine if you were finding the recent EPG useful—and what specific suggestions you had for increasing its usefulness.

1. **YOU ASKED US TO EXPAND THE TECHNICAL DATA REFERENCE.** It's being done. To the present Technical Data Reference the editors are adding—
 - More comprehensive circuit calculations.
 - More data on feeder selection and circuit loading, with recommended standards.

More data on single and three-phase
More detail on particularized
Basic circuitry and operating
applications. — And an entire
cover design and layout data
lighting. It will include table
ballasts, and coefficients of

2. YOU ASKED US TO PUT MORE COMPANIES IN THE NAME DIRECTORY. We're doing our best. We expect about 5,000 this year. The rule governing listings. To obtain license, you must submit proof that the requirement enhances the EPG's value. It prevents "wild goose" product chases. It

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And we are. Product headings are
convenient reference. Cross-refer-
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4. YOU ASKED US TO "BEEF UP" SECTION. You suggested that major local representatives, "more catalogues to make up one grand and glorious book." Other comments on EPG advertising: the editors are heeding your suggestion that manufacturers will provide the type of those daily buying decisions . . . information useful to you—and more profitably.

We'll have another progress report. Meanwhile, we hope you're getting

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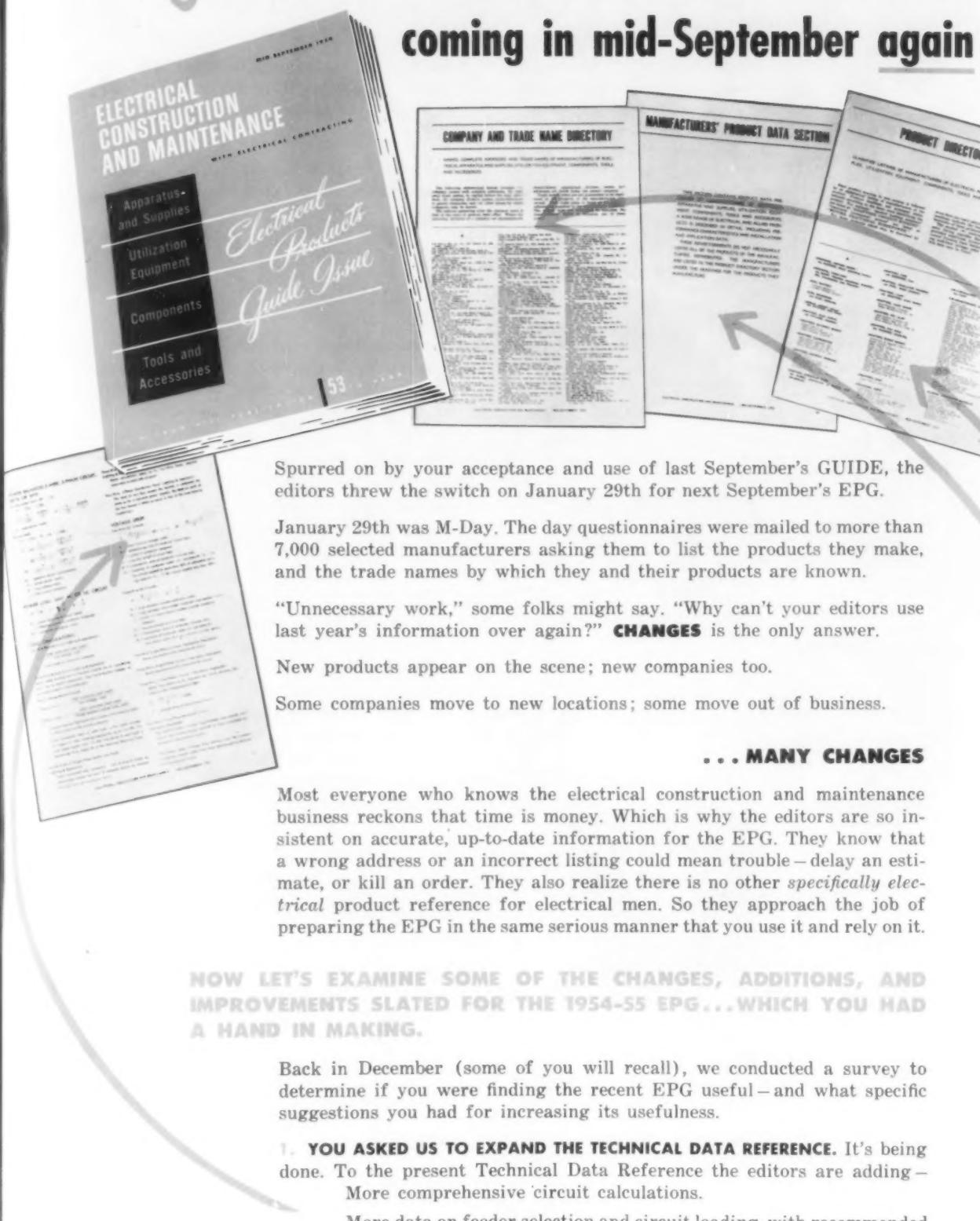
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groundwork for the 1954-55 coming in mid-September again



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1955 Electrical Products Guide!

ain as a regular part of your subscription



More data on single and three-phase motor controls.

More detail on particularized motor selection.

Basic circuitry and operating conditions for industrial electronic applications. — And an entirely new section on lighting that will cover design and layout data for both general and supplementary lighting. It will include tables on lighting intensities, light sources, ballasts, and coefficients of utilization.

2. YOU ASKED US TO PUT MORE COMPANIES INTO THE COMPANY & TRADE NAME DIRECTORY. We're doing our best. There were 2,500 companies last year. We expect about 5,000 this year. However, we aren't relaxing our rule governing listings. To obtain listings, you'll recall, manufacturers are required to submit proof that their products are readily available. This requirement enhances the EPG's value to you — insures accuracy and prevents "wild goose" product chases. In a word, all listings will be **VERIFIED**.

3. YOU ASKED US TO MAKE REVISIONS IN THE PRODUCT DIRECTORY. And we are. Product headings are being revised and expanded for more convenient reference. Cross-references are being improved. **COMPLETE ADDRESSES** are being added to *all manufacturer listings*.

4. YOU ASKED US TO "BEEF UP" THE MANUFACTURERS' PRODUCT DATA SECTION. You suggested that manufacturers include more illustrations, local representatives, "more catalog information" . . . "abbreviated catalogs to make up one grand and glorious reference book." We've passed these and other comments on EPG advertising along to the manufacturers. And, as the editors are heeding your suggestions, we're certain that interested manufacturers will provide the type of product data you need to make those daily buying decisions . . . information that will make the EPG more useful to you — and more profitable to them.

We'll have another progress report on the 1954-55 EPG for you soon. Meanwhile, we hope you're getting the most out of last September's issue.

CLOSING DATES FOR ADVERTISERS

Advertising reservations . . . **June 18th**

Copy to be set . . . **June 25th**

Complete plates . . . **July 2nd**

ELECTRICAL CONSTRUCTION AND MAINTENANCE



A McGRAW-HILL PUBLICATION, 330 WEST 42nd STREET, NEW YORK 36, N.Y.

it's started all over again!

LET



LETTER FROM THE EDITOR

Dear Friends:

The complicated job of assembling, correlating, and checking data which will ultimately appear in our mid-September **ELECTRICAL PRODUCTS GUIDE** is under way. Actually, it seems like only yesterday that we put our first issue to bed. And then sat back to await your reactions and comments.

Your response to our first EPG was indeed gratifying, and your highly constructive suggestions have given us many new benchmarks for making the EPG bigger, better, and more useful to you.

To carry out the job between now and "closing" — still quite a few months ahead — will take several specific staff assignments.

Bill Novak, an electrical engineer who gained his practical experience in the plant electrical department of International Harvester before coming over to the editorial side, will develop the entirely new and revised product listings.

Jack Reynolds, until recently an estimator with A. S. Reynolds Electric Company, who appreciates the everyday need for a comprehensive glossary of trade names, will correlate the Company & Trade Name Directory.

Joe McPartland, who did such an exemplary job with last year's Technical Data Reference, will add much more material, of the type everyone wants, to this important Section. Those of you in the Southwestern states will still be seeing quite a bit of Joe as he covers his regular editorial beat.

Berlon Cooper, our own "Mr. Lighting," has the special assignment to contribute new lighting design and layout reference material for the Technical Data Reference. As always, Berlon's contribution will be top-notch.

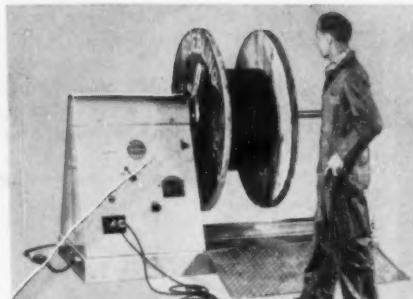
Besides these special assignments, EPG will have top priority claim on all of our staff facilities in the months ahead. Alice McMullen, Gus Eckel, Hugh Scott, and Hi Phillips, our capable art director, will be burning the midnight oil to give you an **ELECTRICAL PRODUCTS GUIDE** directly inspired by the suggestions many of you have made.

Again, many thanks for your great help and interest.

Cordially,

Wm. T. Stuart

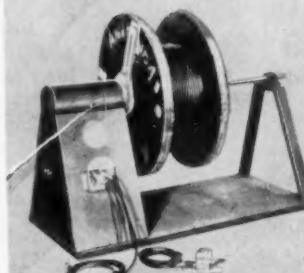
W. T. STUART, Editor



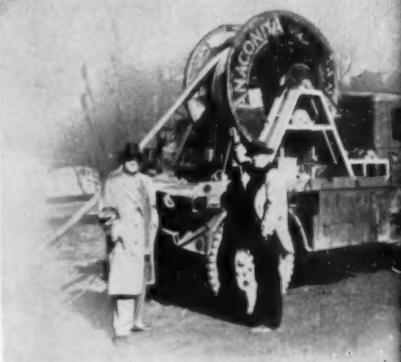
"GIANT" REEL-O-MATIC

Model 30-60...

Handles the largest reels



"MIDGET" REEL-O-MATIC
for "Reel" efficiency and economy



A REEL-O-MATIC earns money for you by reducing the costs of handling cable, wire, messenger strand, etc. In a matter of minutes, measure, coil, and cut an order to specification, saving time, handling, and labor! REEL-O-MATIC, a better job faster.

In addition to the standard models shown, REEL-O-MATICS are constantly being developed to meet special needs.



DIRE
COIL
READY
MEASU
MENT

ELECTRICAL

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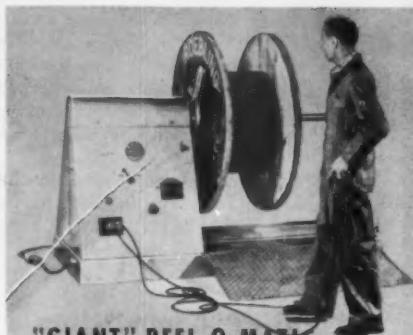
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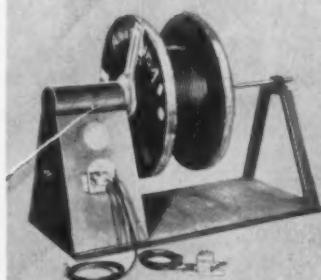
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Model 30-60...
Handles the largest reels

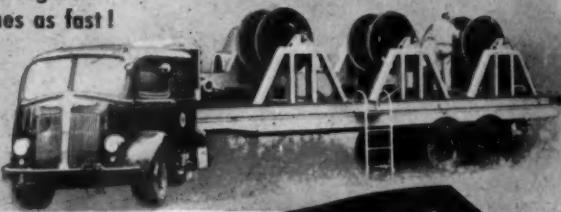


"MIDGET" REEL-O-MATIC
for "Reel" efficiency and economy



Model A—REEL-O-MATIC
Motor Driven
Platform with foot
and-finger controls

REEL-O-MATIC
HIGHLINE UNIT
cuts costs by $\frac{2}{3}$ —
lays highline
3 times as fast!



REEL-O-MATIC
LOWERS COSTS—INCREASES EFFICIENCY...

...for handlers of...

**CABLE • WIRE ROPE
MESSENGER STRAND**

REEL-O-MATIC
T-P UNIT
For Highline and Under-
ground Cable Jobs

*Write
today*

for Free Catalog describing
the complete
REEL-O-MATIC
line of cable
and wire rope handling
equipment... ask for engineering
advice on special problems.



A REEL-O-MATIC earns money for you by drastically reducing the costs of handling cable, wire rope, messenger strand, etc. In a matter of minutes, one man can measure, coil, and cut an order to specification... saving time, handling, and labor! REEL-O-MATIC does a better job faster.

In addition to the standard models shown, special REEL-O-MATICS are constantly being developed to suit spe-

cific needs... the REEL-O-MATIC principle has been successfully adapted to meet many unusual requirements of the U. S. Government, as well as private industry.

To ease your cable and wire handling problems, investigate REEL-O-MATIC... now!

**REEL-O-MATIC CORPORATION of AMERICA
COLUMBIA 1, PENNA.**



COIL/
TURNTABLE



DIRECT
READING
MEASURING
METER



PAY-OUT
REEL CART



WIRE
METER



COIL-O-MATIC



MARION
STORAGE
RACKS

FULLMAN

Latrobe Electrical Products

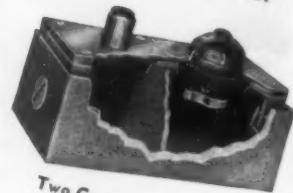
*Floor Boxes
and Wiring
Specialties*

- ADJUSTABLE WATERTIGHT FLOOR BOXES
- NON-ADJUSTABLE WATERTIGHT FLOOR BOXES
- ADJUSTABLE GANG FLOOR BOXES 1-2-3 AND 4
- FLOOR JUNCTION BOXES

Dependable Easy to Install

There are no excess screws, wires or complicated parts in "Latrobe" Floor Boxes and Wiring Specialties. Their design and mechanism is simple, sure and compact.

That is why "Latrobe" Products are so quick and easy to install — so efficient in service.



Two Gang Adjustable
Floor Box

Adjustable Boxes come in single-round or square bodies. Also in square type Single Gang, Two Gang, Three Gang and Four Gang Boxes.

Non-Adjustable Floor Box

Represents the last word in unique design, neat appearance, fewest number of parts, and least amount of labor to install.



Insulator Supports
Malleable iron clamps of high tensile strength. Four sizes to fit all standard porcelain or glass insulators.

Sold Only Thru Wholesalers
Write for illustrated Catalog



UTILITY OUTLETS

- NOZZLES AND FLOOR BOX ACCESSORIES
- INSULATOR SUPPORTS
- PIPE AND CONDUIT HANGERS
- ARMORED CABLE SUPPORTS
- CABLE CLIPS
- STAPLES
- FISH WIRE

Fullman Manufacturing Co.

1209-1215 JEFFERSON STREET

LATROBE, PA.

will center around a brochure entitled "Why You Should Use a Qualified Electrical Contractor". The names of NECA members will be on the brochure which will carry pictures of major electrical installations in Atlanta and surrounding area.

The Atlanta chapter is celebrating its 25th anniversary this year, having been chartered May 11, 1929. Celebration plans have not been completed.

Lighting Competition for 1954 Announced

A competition for the best lighting installation initiated and completed by an electrical contractor between August 1, 1953 and December 1, 1954, when the contest closes, has been announced. Sponsored by *Electrical Construction and Maintenance*, this national contest will be known officially as "Light's Diamond Jubilee Lighting Competition for Electrical Contractors". It will represent the sponsor's tie-in with the national plans of the Sponsoring Committee for Light's Diamond Jubilee, scheduled to reach its climax on or about October 21, 1954 with a two-hour television show telecast over three networks, 75th Anniversary of Edison's invention of the incandescent lamp.

This contest will be similar in most respects to the 1953 National Lighting Competition for Electrical Contractors, announced by *EC&M* in January of last year, and concluded on August 1, 1953.

Purpose of this contest, according to W. W. Garey, publisher of the sponsoring magazine, is "to foster and encourage outstanding lighting installations by electrical contractors, and to stimulate industry interest and activity toward the further progress of electrical illumination". The contest opened February 8, and will close on December 1, 1954.

An electrical contractor, or any full-time employee of an electrical contractor, can enter in the contest a lighting installation of any size which he or some other member of his firm initiated, sold and installed within the period between August 1, 1953 and December 1, 1954.

Three prizes will be awarded in each of six different lighting installation classifications, or 18 prizes total. First prizes will be \$100, plus Award Certificate, plus publication of winning entry in *EC&M*, plus 1000 reprints of the published winning entry. Second prize will be \$75, plus Award Certificate, and third prize will be \$50, plus Award Certificate.

The six classifications for lighting installations are as follows: *Stores*—

"SCOTCH" 27

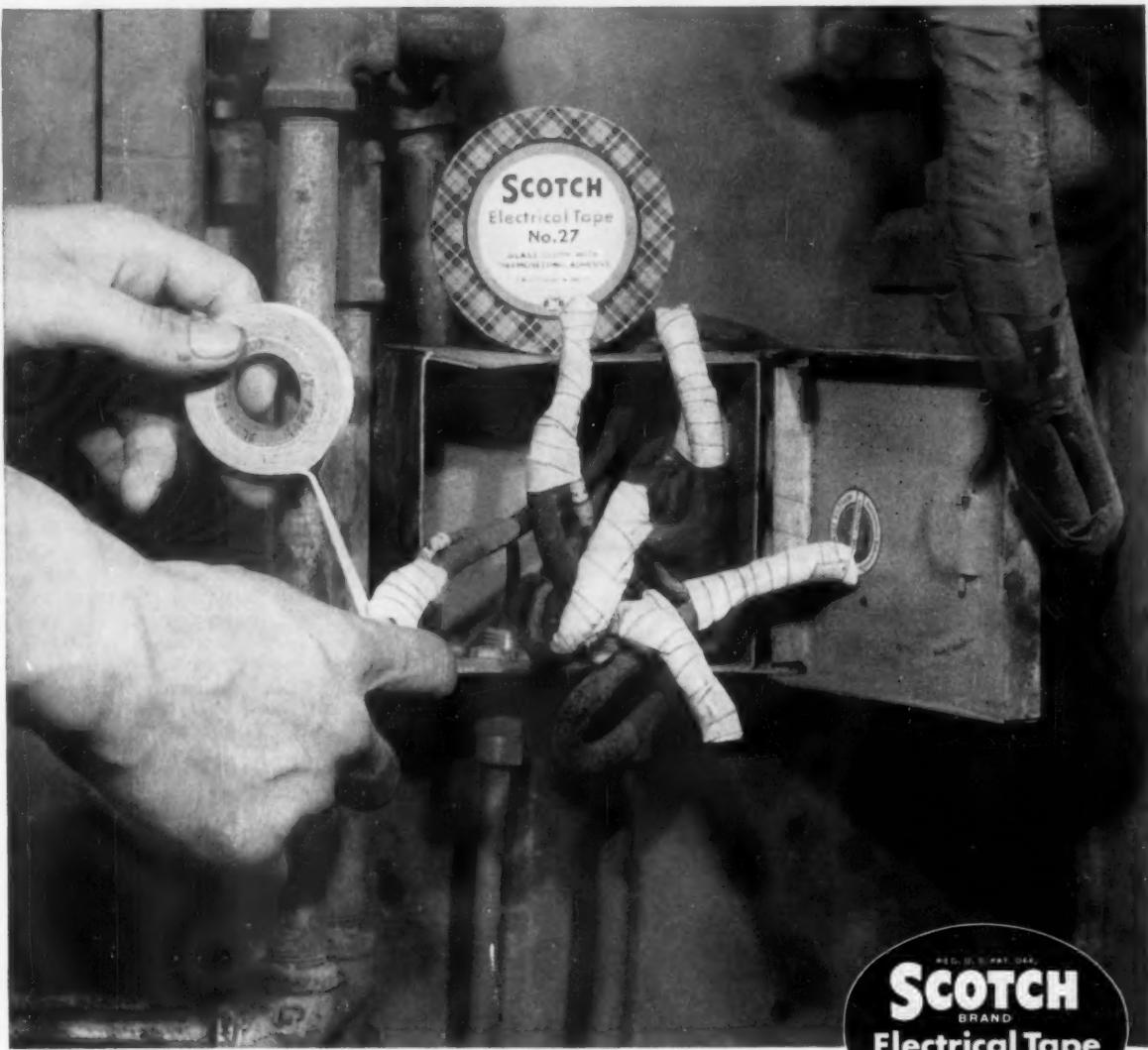
withstands 250° F heat on Timken Company's wiring

Searing heat surrounds these splices! That's why electricians at The Timken Roller Bearing Company's Melt Shop in Canton, Ohio, choose "Scotch" Electrical Tape No. 27 to insulate the control wiring on top-charge electric furnaces.

You see, "Scotch" 27 has a glass cloth backing that won't burn, stretch, shrink or deteriorate. It has a pressure-sensitive thermosetting adhesive that cures

in 1 hour at 300°F to form a permanent bond. And "Scotch" 27 has strength . . . up to 150 lbs. tensile strength per inch of width.

Try it yourself and see! $\frac{1}{2}$ -in.x66-ft. rolls are packed in individual cans. And for complete specifications and other technical information, write Minnesota Mining and Manufacturing Co., Dept. EM-34, St. Paul 6, Minnesota. No obligation, of course.



The term "Scotch" and the plaid design are registered trademarks for the more than 300 pressure-sensitive adhesive tapes made in U.S.A. by **Minnesota Mining and Mfg. Co., St. Paul 6, Minn.**—also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N.Y. In Canada: London, Ont., Can.

REG. U. S. PAT. OFF.
SCOTCH
BRAND
Electrical Tape
No. 27



You get **Unequalled Dependability** with the **PARAGON Memory Master** TIME SWITCH

Moto-Vu operating window, permits instant check of motor operation.

**Quick-change dial trip-
pers.** Add or remove dial
trippers any time, easily
and quickly.

**"Tension-Clutch" dial
drive.** Dial turns freely
to permit manual check
of "on-off" switch opera-
tions . . . yet has posi-
tive, no-slip drive.

"Quick-out"
movement
positively locks
in case . . . no
rattle. Movement
swings right out
when unlocked
. . . with no
loose parts.

**New terminal
block simplifies
wiring — cuts
installation time.**

**Terminal block
insulator.** Full depth
terminal block insu-
lator.



Here's unequalled quality in 24-hour time switches for controlled billboard lights, store illumination, poultry house lighting, stoker operation and hundreds of other applications. Wherever you need automatic "on-off" control, the advance-designed 3000 Series gives you a maximum range of adjustability — up to 16 operations per day. Ask your distributor to show you this great new switch. Compare. Then, you'll see why the beautiful Memory Master is the talk of the trade.

**CHECK ITS
"LOOK-AHEAD"
FEATURES**

**THE BEAUTIFUL
PARAGON
3000 SERIES**

From \$10.50 list



THE SWITCH THAT REMEMBERS . . . AND LETS YOU FORGET

PARAGON ELECTRIC COMPANY
1614 TWELFTH ST., TWO RIVERS, WISCONSIN



C. D. DRAUCKER, president of C. D. Draucker, Inc., electrical contractors of Los Angeles, Calif., looks up from some paper work on his electrical job at the Los Angeles County Law Library.

all interior sales areas; *schools and offices*—classrooms, private and general offices, drafting rooms, conference rooms; *industrial*—factories, warehouses, production and assembly areas, yard lighting, protective lighting, garage repair shops, storage, etc; *residential*—entire house or any parts thereof, including exterior and garden lighting; *floodlighting*—monumental, recreational, spectacular, and utilitarian, including street lighting and spectacular decorative outdoor lighting for holiday or Light's Diamond Jubilee celebration; and *Miscellaneous*—banks, museums, libraries, hospitals, hotels, churches, theatres, restaurants, auditoriums, gymnasiums, lobbies, reception rooms, etc., not otherwise classified.

Entries will be judged December 14, 1954 by a board of three well-known authorities in the lighting industry. Chairman is Thomas S. Kelly, lighting consultant, New York City. Committee members are Thomas F. Coghlan, Illuminating Engineer, Public Buildings Services, General Services Administration, Washington D. C., and C. L. Crouch, Technical Director, Illuminating Engineering Society, New York City.

**Contractors Key To
Wiring Modernization Plan**

Chicago electrical contractors will provide a vital link in a chain of promotional activities planned to stimulate better residential wiring in the Windy City area. This was revealed as the Electric Association announced a 10-point Better Wiring Program at an all-day conference, January 21. The aggressive campaign is aimed at an estimated \$100 million to \$130 million residential rewiring market in the Chicago area plus a general upgrading of new home wiring to Adequate Wir-

High in Profit... low-cost electrical radiant heating



U.S. Rubber's **USKON**[®] ceiling panels put you in the heating business

What does USKON mean to the Electrical Contractor?

FIRST, it can be quickly and easily installed—the panels *now* can be applied in sheet form to existing ceilings. No extensive wiring or alterations needed. A minimum of trouble and time for you. It keeps your costs down.

SECOND, Uskon is a proven seller. With Uskon the homeowner knows he can heat his house as it grows; when he wants to finish expansion attics, he merely orders some more Uskon panels from you. This is truly the heating system that fits everybody's needs and offers you repeat business.

THIRD, Uskon is a product of United States Rubber Company. It has been tried and proved for several years with complete success in homes, apartments, offices, expansion attics, commercial and indus-

trial buildings, bathrooms, sun porches, game rooms, garages, basements, motels, summer cottages. Uskon has revolutionized electrical radiant heating!

Everybody wants USKON electrical radiant heating! Architects like the freedom of design it gives them—no radiators, furnaces, pipes, ducts, and so on. Decorators like Uskon for the same reason, plus the fact that it can be painted over with any ordinary flat paint.

Home Owners prefer Uskon because it costs less to install than almost any other kind of heating—and because it gives quick heat with a switch or thermostat. Uskon can be installed in

one room or in all rooms; completely eliminates every kind of nuisance found in ordinary heating systems. Approved by Underwriters' Laboratories, Inc.

As an electrical contractor, you will find Uskon electrical radiant heating to be one of your most profitable items. It is made by United States Rubber Company, a great name known for quality products everywhere—a name that helps you sell. For complete technical data and cost information write for Catalog M3177, Mechanical Goods Division, United States Rubber Company, Rockefeller Center, New York 20, N. Y.



UNITED STATES RUBBER COMPANY
MECHANICAL GOODS DIVISION
ROCKEFELLER CENTER, NEW YORK 20, N. Y.



Perhaps not. Mr. Electrical Contractor, but are you charging today's prices and have you printed price sheets to back you up?

You can easily prove every price you quote or charge with good hard facts if you use

NATIONAL PRICE SERVICE

Service never gets tired. It's on the job 365 days a year. It provides you with YOUR accurate up-to-date FIGURED NET COSTS of materials. Add to that comparative catalog numbers, list prices, standard packing quantities, short, concise material descriptions PLUS illustrations of every listed item—all under one cover, easy and ready to use. Add fair, profitable, suggested selling prices and you have—

NATIONAL PRICE SERVICE

You owe it to yourself and your business to know the full story of this profit-packed Service. Write—without obligation of any sort—then decide for yourself how NATIONAL PRICE SERVICE can add profit dollars, save costly hours, make work easier—FOR YOU!



NATIONAL PRICE SERVICE is available only to recognized Electrical Contractors—and—its fee is very nominal. If you are an Electrical Contractor, you are invited to write our Inquiry Department on your letterhead for a full description at no obligation whatsoever. Make NATIONAL PRICE SERVICE your key to more profitable, less burdensome pricing.

NATIONAL PRICE SERVICE
HENDERSON-HAZEL CORPORATION

13601 EUCLID AVENUE, CLEVELAND 12, OHIO



ELECTRICAL CONTRACTOR Emil DeHaan, Service Electric Co., Chicago, tells Better Wiring Conference that appliance distributors have been riding on diversity factor and overfusing; warns that wiring modernization is the only way to break the existing bottleneck.

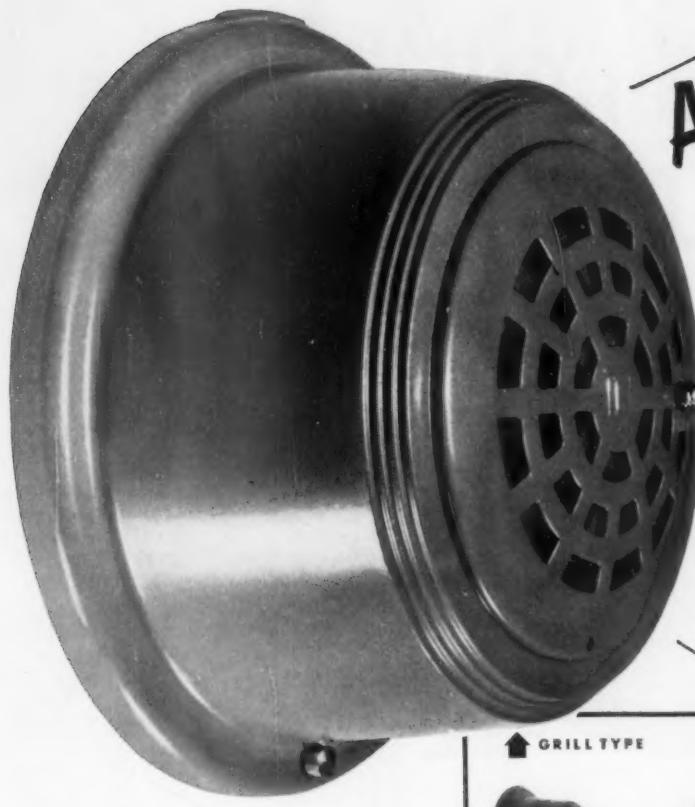
ing standards or better. Present plans call for concentration on this market over the next 10 years.

Here is the Chicago situation as disclosed at the meeting. Of about 50,000 new homes built in 1953, less than 2,000 were Certified AW units. Of approximately 1,550,000 residential units (including 500,000 single-family residences) in the five counties comprising the Chicago area about 1,300,000 units were wired prior to the 1938 change in wiring code requirements and have not been rewired in the interim.

The problem here, as in most cities and towns, is that the wide variety of 1954 appliances with their higher wattage ratings are being hitched to 1920 wiring systems. Electrical contractor Emil DeHaan, Service Electric Co., a residential wiring specialist, summed up the situation like this: "The appliance dealers have been riding on a diversity factor and overfusing. New plants of appliance manufacturers are pushing products into pipelines that even slashing prices can't open up." That the wiring bottleneck has reached a critical stage was emphasized by this statement: "Despite the demand for more equipment than was available in the Chicago area in 1953, air conditioning dealers reported merchandise returns approaching 20% of all equipment sold . . . cancellations occurred in each instance because the customer was confronted with grossly disproportionate wiring installation problems."

Industry's approach to this challenging wiring market is to be twofold:

1. A unified industry effort to sell by promotion and advertising, consumer acceptance and demand of the advantages of electrical living.



Amp for Amp
 LOUDEST
 HORN
 On The Market

TOP THESE LOUDNESS FACTORS

(Edwards 115 volt AC Adaptahorn)

type	decibels*	loudness units
flush	94	52,000
projector	91	40,000
grille	98	80,000

*at ten feet



(Flush type horn also available)

**Only Edwards New Adaptahorn
 Offers All these Profit-Making
 Features**

1. Outstanding finish and appearance.
2. Greater carrying tone at minimum current.
3. Rugged, shock-proof . . . die-cast housing.
4. Non-adjusting. Subjected to severe life tests without failure or need for adjustment.
5. Muting feature standard in all models.
6. Interchangeable with 6" and 10" Adaptabells on same mounting plate.
7. Weatherproof construction.
8. Front wiring and plug-in type connection . . . No "juggling" when installing.
9. Elongated mounting holes for easy alignment.
10. Female receptacle on mounting plate eliminates exposed "hot" points.
11. Can be mounted on all standard outlet boxes.
12. Listed by Underwriters' Laboratories.

The Edwards ADAPTAHORN is tops in performance, economy, appearance! From a whisper to a BELLOW—or for any sound intensity in between—the Adaptahorn never changes decibels once it's set. This powerful Grille type horn is ideal where sound coverage over wide areas is needed!

Easy to install . . . easy to adjust . . . sealed in mechanism (no clogging from dust and dirt) . . . heavy-duty, long-lasting movement. Made of rugged zinc die-casting—no other horn can match Adaptahorn's durability with such low cost.

Let Edwards' 82 years of experience work for you! Install Edwards new Adaptahorn for your next signal job. There's no horn like it! For proof, write Dept. EC-3, Edwards Company, Inc., Norwalk, Conn.

EDWARDS

*World's most reliable time,
 communication and protection products*

**NOW! FOR BRILLIANT, COLORFUL,
EYE-WINNING DISPLAYS THAT
LIGHT UP THE SALES PICTURE...**

AMPLEX COLORBEAMS



IT'S THE SAME for your window and your interior displays... it's color that attracts attention... quickens interest... adds the sparkle and zest that makes merchandise look its best and really move! And you can use color most effectively with Amplex Colorbeams because their vivid hues are artistically true... each one designed for top effectiveness in heightening the attractiveness and drawing power of your displays.

Besides this, Amplex Colorbeams always enable you to get exactly the desired effects, with utmost ease and at lowest cost. They give you a wonderful choice of 14 colors. Their color is a permanent, integral part of the glass. It never fades, cracks or chips. The sealed-in reflector linings are pure silver... *always* provide maximum light intensity. And Amplex Colorbeams have a rated design life of 2000 hours! Write for the full story.

AMPLEX CORPORATION
Dept. C-3 111 Water St., Brooklyn 1, N. Y.

AMPLEX



HOME WIRING MODERNIZATION Committee chairman, E. H. Wigdahl, Wigdahl Electric Co., tells Chicago Electric Association Better Wiring Conference about the standard 100-ampere service "package" to be offered homeowners during rewiring promotion campaign. Wigdahl is using package-price method in his own contracting business.

2. A unified direct-merchandising type selling effort to break the wiring bottleneck facing both the home owner and apartment dweller.

The electrical contractors will play their major role in the second plan. To reach the new home market, a Contractor Cooperative Plan is being sponsored and coordinated by the Electric Association. Cooperating electrical contractors will be offered the services of an Association staff man once a month. Contractors will receive AW decals and identifications for their trucks and offices; a direct mail campaign with letters written on their own stationery; an indoor and outdoor advertising kit containing large project sign, small home signs plus 27 arrows and cards to point up adequate wiring in model homes; industry advertising of their accomplishments.

The Home Wiring Modernization campaign will start with three pilot projects now being developed. Each project (one in the north, west and south areas of Chicago) will constitute about one square mile or 2,000 residential buildings, most of them single-family units. One electrical contractor will be designated for each project.

A direct mail campaign, with return post card, will be directed to home and building owners in each project. Telephone follow-ups will be made on all who do not return the cards.

Leads developed by direct mail and telephone follow-up will be called on by a utility and contractor representative.

The three pilot projects will be con-

Where Lighting keeps pace with MODERN SCHOOL PLANNING



New Sylvania IC Fluorescent Fixtures meet highest standards of new Thomas Jefferson Junior High School, Clairton, Penna.

In planning this handsome new junior high school, educational authorities, architects, and lighting engineers agreed that the new Sylvania IC Low-Brightness Fluorescent Fixtures with 42° crosswise shielding met their strict requirements for uniform light distribution, quick easy installation, low maintenance, and attractive appearance.

On the subject of installation and good business, Mr. George W. Hiles, the Electrical Contractor for this job, wrote: "We are glad we used Sylvania Fixtures on this job. We saved ourselves a lot of time because they are so easy to install. One day, using 8 men, we installed 114 fixtures. Another good feature is Sylvania's guarantee that covers their fixtures and lamps during the period we service the over-all job. The way we figure it, we're ahead of competition every time we use Sylvania fixtures."

Let us give you full information concerning the many advantages of Sylvania's new line of IC Fluorescent Fixtures. For illustrated folder simply address Sylvania, Dept. 4X-2403, today.



George W. Hiles
Hiles & Lightholder Co.
Electrical Contractors
Canonsburg, Penna.



SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.



In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine Street, Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

HOW RELIANCE PROTECTS

Your time switch profits!



LOW INITIAL COST

The entire line of Reliance Time Switches is competitively priced, and produced by a pioneer in the industry.



TROUBLE-FREE SERVICE

With every Reliance time switch installation you can feel sure . . . and secure that you will keep your profit. That's because Reliance products require a minimum of maintenance expense.



BUILDS CUSTOMER GOOD WILL

Reliance time switches help build prestige and extra sales for you, because they require so little service and provide so much in customer convenience.

Send for FREE catalog

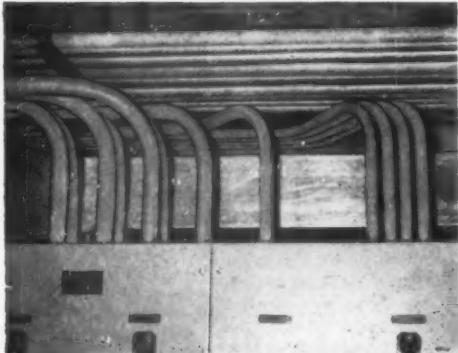
RELIANCE AUTOMATIC
1937 Mead St.,

LIGHTING COMPANY
Racine, Wis.



Reliance
Model "400"
S.P.S.T. 20 AMPS, 125 V.

RELIANCE TIME SWITCHES



Savings on the first 90 bends repaid the *entire cost* of this Tal ONE-SHOT Bender—used in the electrical installation at new Technical Buildings of the Milwaukee Vocational School. 621 90° bends were made in 1 1/4" to 3" conduit, saving 621 elbows and cuts, and many more threads and couplings. Only 3 elbows were used on the entire job BECAUSE the Tal ONE SHOT completes bends in one single operation! No shifting of conduit is necessary.

- 427 1/2 hours in time
- \$438.56 in materials

SAVED ON ONE JOB WITH A TAL PORTABLE BENDER

by
Magaw Electric Co.
Milwaukee



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CONTRACTOR COOPERATIVE PLAN to sell more wiring in new homes is reviewed by H. C. Moses, Jr., general chairman, Chicago Electric Association Adequate Wiring Committee as he outlines Association's 10-point Better Wiring Program to industry dinner meeting.

ducted for three months. Any interim changes in procedure will be based on reports and analyses at the end of each 30-day period. After the three months are up, careful analyses of the three projects will be made to determine future action. Whether or not this plan is to be extended to the entire Chicago metropolitan area will be determined at that time. Should a broad program be developed, all electrical contractors will have a hand in it.

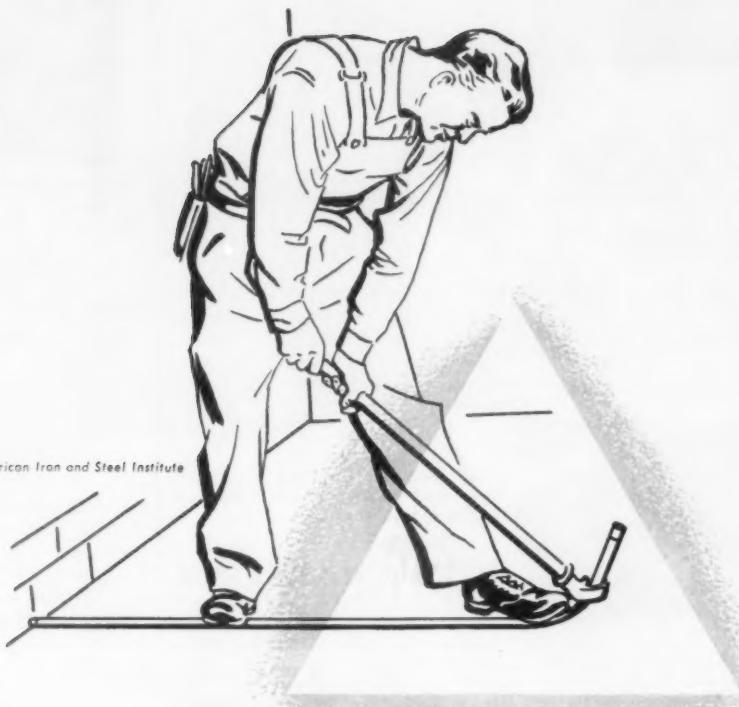
Biggest feature of the Home Wiring Modernization Plan is the standard "package" to be offered by the contractor. This will include a 100-ampere, 3-wire service, provision for an electric range circuit, two appliance circuits and six other branch circuits. HWM Committee Chairman Ed Wigdahl, an electrical contractor, feels this package can be offered at an attractive price if volume for each cooperating contractor is sufficient to warrant specialized crews and a mass-production approach. In fact, Wigdahl is so sold on the idea that he is using it in his own business.

A similar direct-merchandising effort by the industry, including contractors and distributors, is to be directed to multiple-occupancy property owners to sell them complete wiring and appliance modernization of all dwelling units on a per-building basis.

As to business potential, Chairman Wigdahl estimates it will take 30 to 50 electrical contractors to do \$10 million worth of electrical modernization work each year for the next ten years. That is the target for the contractors.

Other steps in the Electric Association 10-point Better Wiring Program include:

Illustration, courtesy of American Iron and Steel Institute



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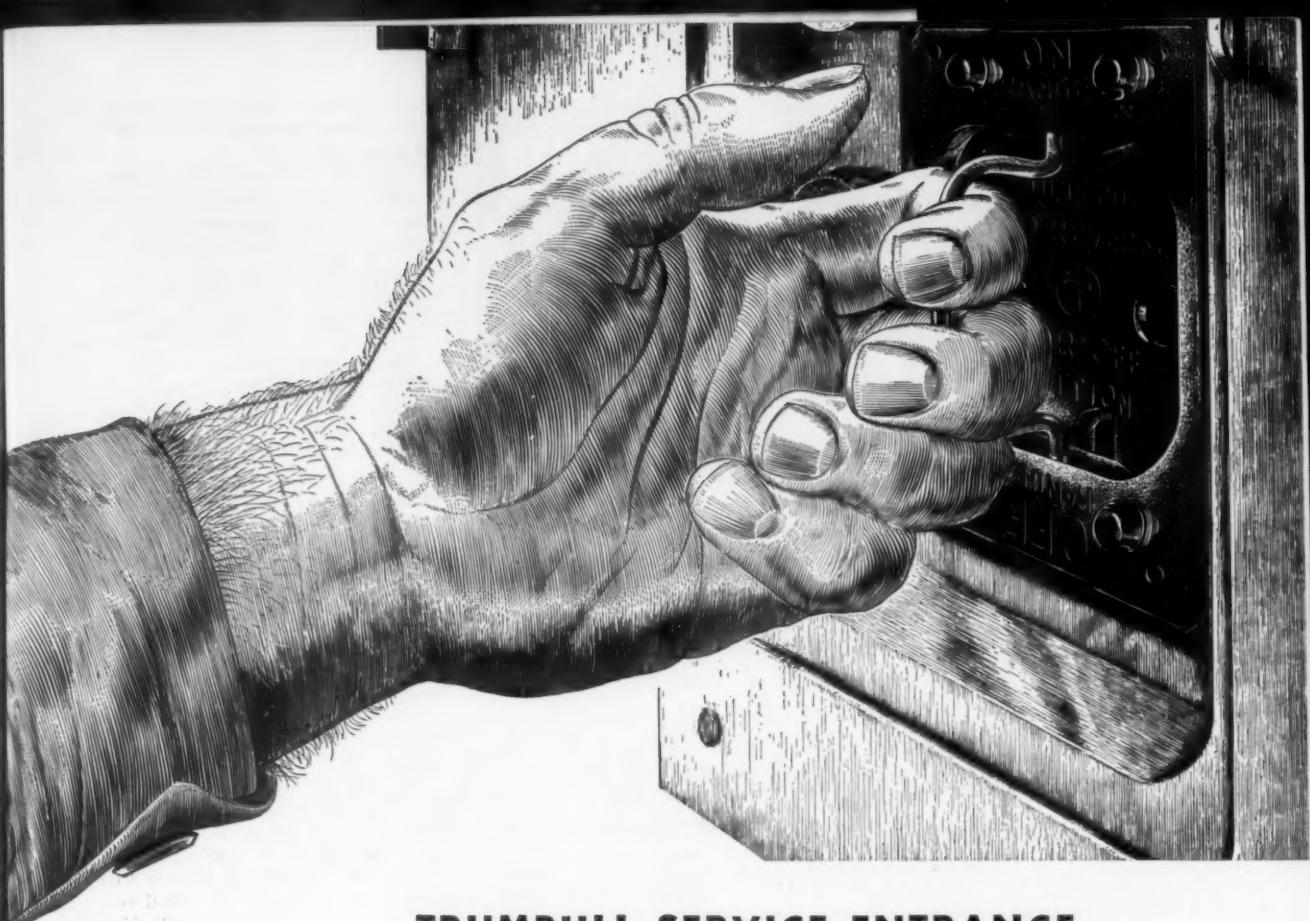
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ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . MARCH, 1954



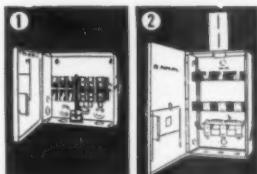
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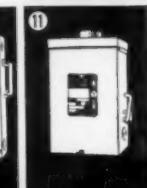
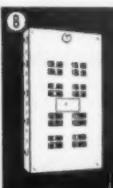
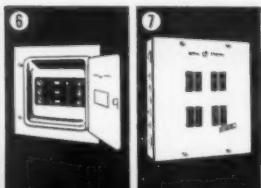
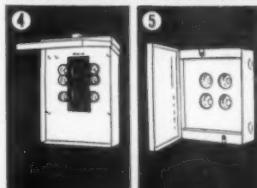
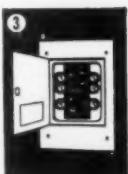
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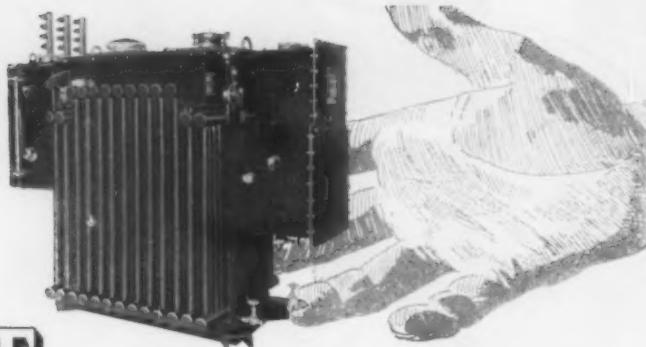
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father, J. Walter Collins, last spring. Collins also serves as Chapter secretary and treasurer.

Elected to serve with Mr. Leasure on the Executive Committee are the following electrical contractors: Oliver F. Burnett, Jr., Kelso-Burnett Electric Co.; J. N. Pierce, Pierce Electric Co.; A. C. McWilliams, McWilliams Electric Co., Inc.; L. W. Johnson, Johnson Electric Co.; W. W. Giesen, Electrical Contractors, Inc.; C. P. Walters, Fries-Walters Electric Co.; W. J. Howe, J. Livingston & Co.; T. L. Hankins, Condo Electric Co.; and Fred Stoeck, Hoffman Electric Company.

Illinois Inspectors Elect Maltby Chairman

J. Gordon Maltby, chief electrical inspector, Evanston, Ill., was elected chairman of the Illinois Chapter, International Association of Electrical Inspectors, at the 24th Annual Meeting of that group in Chicago's Hotel Sherman, Jan. 14-15.

Chosen at the same time to serve with Maltby as Chapter officers were the following inspectors: first vice chairman—J. J. Ryan, City of Chicago; second vice chairman—Joe Crosno, Corn Belt Rural Electric Cooperative, Bloomington, Ill.; third vice chairman—J. P. Corcoran, Mill Mutual Fire Prevention Bureau, Chicago; secretary-treasurer—Clarence A. Wingfield, Commonwealth Edison Co., Chicago.

Industry representatives on the Executive Committee include: Cal Condon, Flossmoor, Ill.,—chairman; E. M. Nelson (manufacturers), National Electrical Products Corp., Chicago; Leo W. Witz (contractors), Continental Electrical Construction Co., Chicago.



ILLINOIS CHAIRMAN of IAEI Chapter, J. Gordon Maltby (left), Evanston, receives congratulations from K. R. Horner, immediate past chairman of the Illinois Chapter, International Association of Electrical Inspectors, following election at annual meeting in Chicago.

NISA News

NISA's exhibit at the Plant Maintenance Show in Chicago marked its third participation in this affair. The booth was very nicely decorated with NISA emblems and some samples of work performed by the organization. Large corner display provided ample room. Many members from districts outside of Chicago attended this interesting show. Fred Wipperman, Executive Secretary, headed the list of NISA visitors at the booth.

• • • •

Niagara Chapter met at Rochester, New York, on February 5th at the Leider-Kranz Club. Fifty-three members were in attendance. Members from Syracuse, Buffalo and Niagara Falls, the cities covered by the Chapter, were in attendance. A new slate of officers were nominated and elected at this meeting: Cliff Nelson, Rochester, N. Y.—President; John Farrell, Buffalo, N. Y.—1st Vice-President; Frank Egloff, Buffalo, N. Y.—2nd Vice-President; Walter Nowacki, Niagara Falls—3rd Vice-President; and Don Murray, Syracuse, N. Y.—4th Vice-President. Ralph Barker, Niagara Falls was re-elected as secretary-treasurer for a third term.

E. F. Greiwe, application engineer of Norwood Works, Allis-Chalmers Mfg. Co., spoke on the subject of new NEMA standards for frames.

The following visitors from the New York Metropolitan Chapter were guests at the meeting: M. Benjamin, Empire Electric Co. Inc.; Ernie Burns and J. Brown, Brownell Distributors, Inc.; M. Friedkin, Electric Enterprise Co. and W. J. Prise, The Maintenance Company, Inc.

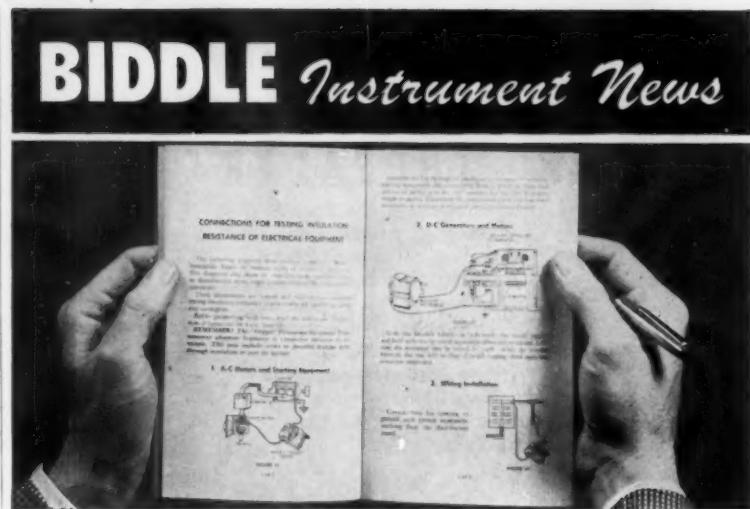
Meyer Friedkin and Walter J. Prise visited the shop of Berger Bros. Electric Motors, Inc. and were conducted on the trip by Stanley Pflaum and Cliff Nelson. They also visited T. H. Green Electric Company where Ray Hornbeck showed them the shop and explained extensive contracting operations of the company. The next meeting of the Chapter is scheduled tentatively for Syracuse, New York.

• • • •

San Diego Chapter held its annual "Ladies' Night" dinner meeting December 17th at Langhorst Cafe overlooking San Diego Bay. The meeting, one of the largest ever held by the chapter, included a short business session followed by motion pictures.

• • • •

Thirty-two members and guests registered for the fourth quarterly meeting of the Mid-South Chapter held in Birmingham, Ala. at the St. Fran-



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cis Hotel. The group was welcomed by Walter G. Brush, Electric Motor Service, Birmingham. Mr. Brush then presented a brief talk on the NISA standard accounting system, "Book-keeping Made Easy". This was followed by an open forum, after which the group adjourned for luncheon at Chris' Restaurant.

Chapter President Thomas M. Russell, Russell Electric Co. Inc., Mobile, Ala. opened the afternoon session and conducted the group's business meeting, including the acceptance of the nominating committee's recommendations for new officers. These included: president, Paul Bonham, Tri-State Armature & Electric Works, Memphis; vice-president, Walter G. Brush, Electric Motor Service, Birmingham; secretary-treasurer, Murphy G. Miller Sr., Tennessee Electric Motor Service, Knoxville; and director, M. M. Argo Jr., Birmingham Electric & Mfg. Co., Birmingham. The next meeting will be held in Mobile, March 20th.

• • • •

Ontario Chapter met January 16th at the Hotel London, London, Ont. the agenda consisted of committee reports and election of officers. Results of the election will be reported later.

• • • •

Northern California Chapter held its bi-monthly meeting December 7th at St. Julien Restaurant, San Francisco, with 12 present. Following dinner a general business discussion was held, including the nomination of three members for 50-Year Award certificates at the Detroit Convention.

• • • •

It was Ladies Night, December 8th at the Los Angeles Chapter's meeting at Rodger Young Auditorium. Jack Streeter, a past national president of the American Federation of Mineralogical Societies, spoke on "Gem and Mineral Hobby." Officers for 1954 elected include: chairman, William Pompey, Pompey Electric Motor Service, Pasadena, Calif.; vice-chairman, Lloyd J. Mokler, Zamboni Brothers, Paramount, Calif.; secretary, Bernard J. Marcus, Marcus Electric Co., Glendale, Calif.; treasurer, Russell C. Lockard, Lockard Motor & Pump Co., Huntington Park, Calif. Lockard was re-elected.

The meeting was concluded with a showing of "The Real Discovery Of California", a sound motion picture.

• • • •

Among recent visitors to National Headquarters was Paul M. Martin, Northwestern Electric Co., Chicago, who reports his firm is engaged in

some interesting developments in high-altitude, air-borne motors.

The O'Brien Machinery Co., Philadelphia, Pa., opened a sales and service office at Stoney Creek Mills, Reading, Pa., to serve customers in the Lancaster, Reading, Harrisburg and Pottstown areas. The new branch is part of an expansion program the firm is undertaking, which includes a foundry division at its home office, 1541 Delaware Avenue.

Five regional directors were elected to the NISA Board of Directors last month: Joseph H. Previty, Penn Electric Motor Co., Philadelphia, Region 3; Chas. J. Covington, Dowzer Electric Machinery Works, Mt. Vernon, Ill., Region 12; Murphy G. Miller, Tennessee Electric Motor Service, Knoxville, Tenn., Region 6; Paul M. Sievert, Sievert Electric Co., Chicago, Region 9; and C. H. Blenkhorn, Blenkhorn & Sawle, Ltd., St. Catharines, Ont., Region 15.

Previty, NISA secretary, and Covington have been directors-at-large.

Terms of the directors are three years, beginning after the Annual Meeting in June and expiring in 1957.

New England Chapter held its regular meeting at the Hotel Bradford on January 14th and Pres. Ed. Kolhonen presided. The Secretary's report was read and accepted. The President reported on the tentative plans for a Foremen's Meeting.

Several very interesting questions were pulled from the Question Box and were discussed quite thoroughly.

Program Chairman Arthur Glines introduced the speaker for the evening, R. MacCune of the Despatch Oven Company, who gave an interesting talk on baking ovens.

Quaker City Chapter held its regular meeting January 13th at Beck's-On-The-Boulevard. An interesting talk on "AC Motor Controls in Modern Industry" was given by Fred Lawrence of the Furnas Electric Company.

New York Metropolitan Chapter held its first meeting of the year at the Shelburne Hotel on January 21st. Al Shovan, President of the Chapter conducted the meeting and Hillrie Griffith, Belyea Company, Inc., was principal speaker, talking on subject of Direct Current Problems.

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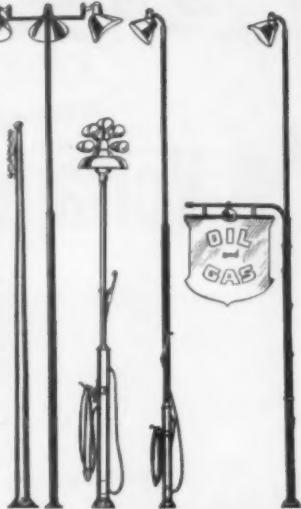
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Book Reviews

Cold Cathode Fluorescent Lighting Handbook

Illuminating engineers and others involved in the design and layout of lighting systems have long felt the need for authoritative and factual information pertaining to cold cathode lighting. That need has now been met by the Fluorescent Lighting Association, in the form of a 52-page "Handbook of Cold Cathode Fluorescent Lighting". Prepared by Bernard F. Greene, consultant to FLA, this handbook contains complete data on the electrical and photometric properties of the cold cathode lamp and auxiliaries, including information on the proper methods for using and installing cold cathode lamps.

Included in the handbook are sections on general principles of lighting and lighting design, how fluorescent lamps work, types of fluorescent lamps, auxiliary equipment, photometric data, lamp life, lumen maintenance, economics of long life lamps, lamp operating temperature, direct current operation, stroboscopic effect, dimming, vibration, radio interference, color, how to calculate illumination, coefficients of utilization, dimensional data, how to install cold cathode, cove lighting, luminous ceilings, and examples of installation. It is fully illustrated with charts, graphs, diagrams and typical application installation photographs.

A factor which made this handbook possible is the FLA Lamp Certification program put into effect during 1953, in which the individual manufacturers of cold cathode lamps have their lamps checked by an independent testing laboratory against a set of exacting performance characteristics. Lamps of manufacturers meeting these specifications are then certified by FLA. All data and information in the handbook are based on the standards established for the FLA-certified cold cathode lamps.

This new handbook is published by the Fluorescent Lighting Association, 100 West 42nd Street, New York, N. Y. Price is \$1.00 per copy.

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tects, interior decorators and designers, portable lamp makers, educators and others concerned with residence lighting make use of the newly published home lighting guide, the "IES Recommended Practice for Residence Lighting". Containing 44 pages, this fully-illustrated treatise was prepared by an Illuminating Engineering Society Committee on Residence Lighting comprised of home lighting experts from electrical utility companies and lighting equipment manufacturer.

The new Recommended Practice for Residence Lighting is primarily devoted to the basic lighting requirements for family activities involving close vision, such as the selection and placement of portable lamps for sewing, reading, reading in bed, desk work, piano playing, kitchen and laundry activities. Desirable types of table and floor lamps for such activities are shown, and accurate measurements as to their position with respect to the work and user are given in inches. Types of installed lighting fixtures for living rooms, dining rooms, bedrooms, kitchens and bathrooms with accurate directions for obtaining maximum efficiency and value are included. The Practice also covers lighting of special areas such as playrooms, closets, porches and outdoor areas. Each of these lighting problems are discussed in detail and most are illustrated to show the completed lighting job.

A special feature of this report is a discussion of the visual environment which may be created with colors, and the effects of light on these colors. A color-chip chart showing a suggested range of 30 colors for ceilings, walls and floors, and their reflectances, is included because of the importance of finishes and reflectances to appearance, visual comfort and lighting efficiency in the home and elsewhere.

Easy-to-use tables contain other information vital to home lighting. Table I gives recommended lighting intensities for both general lighting and specific visual tasks for residences. Table II furnishes details as to the appearance of each of the colors under two different types of illuminant, their Munsell color designations, and reflectance percentages. Table III provides dimensions of well-designed portable lamps, their height and shade dimensions. Table IV gives Room Description in Total Area, and Table V is a guide to approximate lamp footage per room required for general lighting using linear wall lighting with fluorescent equipment.

The IES Recommended Practice for Residential Lighting is published by the Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y. Price is \$1.00 per copy.

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DATES AHEAD

American Power Conference—Sixteenth Annual Meeting, Sherman Hotel, Chicago, March 24-26.

Industrial Electrical Exposition—sponsored by Milwaukee Electrical Maintenance Engineers, Public Service Building Auditorium, Milwaukee, Wisconsin, March 30-31.

Central Jersey Electrical & Industrial Show—Sponsored by the Central Jersey Electrical League, Trenton Armory, Trenton, N. J., March 30-April 1.

Electrical Industry Convention and Trade Exposition—St. Paul, Minn., March 21-24.

National Power Show—Hotel Sherman, Chicago, Ill., March 23-27.

Electrical Industry Show—Shrine Exposition Hall, Los Angeles, Calif., April 1-3.

Edison Electric Institute—Sales conference, Edgewater Beach Hotel, Chicago, Ill., April 5-8.

Illuminating Engineering Society—Regional Conferences: Southern—Roosevelt Hotel, New Orleans, La., April 8-9; Southwestern—Rice Hotel, Houston, Texas, April 11-13; Inter-Mountain—Denver, Colo., April 15-16; South Pacific Coast—Museum of Art, San Francisco, April 19-20; Pacific Northwest—Benjamin Franklin Hotel, Seattle, Wash., April 22-23; Canadian—King Edward Hotel, Toronto, Ont., Canada, April 28-30; Great Lakes—Sheraton-Cadillac Hotel, Detroit, Mich., May 3-4; Midwestern—Jefferson Hotel, St. Louis, Mo., June 17-19.

American Society of Tool Engineers' Industrial Exposition—Convention Center, Philadelphia, Pa., April 26-30.

Welding & Allied Industry Exposition—Sponsored by American Welding Society, Memorial Auditorium, Buffalo, N. Y., May 5-7.

Electrical Manufacturers Representatives of New England—Trade Show, Mechanics Building, Boston, Mass., May 5-7.

National Fire Protection Association—58th annual meeting, Statler Hotel, Washington, D. C., May 17-21.

Edison Electric Institute—Annual convention, Atlantic City, N. J., June 1-3.

National Association of Electrical Distributors—Annual convention, Atlantic City, N. J., Week of June 6.

National Industrial Service Assn.—Annual convention, Hotel Statler, Detroit, Mich., June 13-16.

N. Y. State Electrical Contractors and Dealers, Inc.—Annual convention, Saranac Inn., Saranac Inn, N. Y., June 28-July 2.

Western Plant Maintenance Show and Conference—Pan Pacific Auditorium, Los Angeles, Calif., July 13-15.

Illuminating Engineering Society—National Technical Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., September 12-16.

International Association of Electrical Leagues—Bellevue Stratford Hotel, Philadelphia, Pa., September 29-October 2.

National Electronics Conference, Inc.—Hotel Sherman, Chicago, Ill., October 4-6.

Eastern Canada All Electrical Show—Show-Mart Exhibition Hall, Montreal, Quebec, Canada., October 6-10.

National Electrical Manufacturers Assn.—Haddon Hall Hotel, Atlantic City, N. J., November 8-11.

Among the Manufacturers

Headquarters Announcements

Minnesota Mining & Mfg. Co., St. Paul, Minn.—John E. Cahill, supervisor of design engineering, electrical products group.

American Radiator & Std. Sanitary Corp., Sunbeam Air Conditioner Div., Pittsburgh, Pa.—Henry E. Rossell, Jr., manager of dealer development; W. Walton Woodrooff, manager of cooling sales.

Electric Storage Battery Co., Philadelphia, Pa.—Edmund J. Fitzmaurice, Jr., manager of sales engineering and advertising, Industrial Div.

Eutectic Welding Alloys Corp., Flushing, N. Y.—Fred F. Roehll, vice-president, sales.

Revere Electric Mfg. Co., Chicago, Ill.—Stanley M. Starr, manager of street lighting sales.

General Electric Co., Major Appliance Div., Louisville, Ky.—Carl L. Bixby, Jr., manager, automatic clothes dryer sales.

Reon Resistor Corp., Yonkers, N. Y.—Neil R. Seitzman, sales manager.

Progress Mfg. Co., Philadelphia, Pa.—David Lane, executive vice president; Edward K. Baker, vice president, sales.

Northwestern Electric Co., Chicago, Ill.—Geo D. Craig, Jr., general sales manager.

Advance Transformer Co., Chicago, Ill.—New plant at 2950 Northwestern Ave.

General Electric Co., Chemical Materials Dept., Pittsfield, Mass.—Boyette Edwards, Jr., supervisor of industrial engineering, Phenolic Products plant.

Radiant Lamp Corp., Newark, N. J.—Carl L. Krueger, sales manager.

Orangetburg Mfg. Co., Orangetburg, N. Y.—Wilbur S. Holton, vice pres.

Indiana Steel Products Co., Valparaiso, Ind.—James R. Ireland, assistant director of research; James G. Richmond, assistant manager of mfg.

Weston Electrical Instrument Corp., Newark, N. J.—Frank X. Lamb, vice president; Roswell W. Gilbert, assistant to the president.

Westinghouse Electric Corp., Air Conditioning Div., Pittsburgh, Pa.—John A. Gilbreath, division manager.

Noma Lites, Inc., New York, N. Y.—William R. Hamilton, vice-president and director; David L. Kaltman, director.

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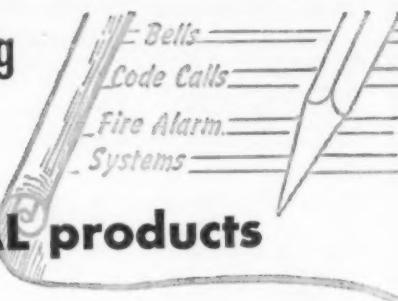
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SWAPPING THEORIES on the art of relaxing, prior to a business meeting, are Milwaukee contractors E. J. Czechan (left), Northern Electrical Contractors, Inc.; and Walter Kaczmarski, Home Electric Company. Both are members of the Milwaukee Chapter, NECA.

Bryant Electric Co., Bridgeport, Conn.—Harold Hey, general sales manager, Wiring Device and Hemco Plastic Div.; Clyde W. Foster, specialties sales manager, plastic products.

Buchanan Electrical Products Corp., Hillside, N. J.—James O. Johnson, general sales manager.

Regional Appointments

NEW ENGLAND

General Electric Co., Electronics Div.: Jon B. Jolly, sales and application engineer for germanium products, office in Clifton, N. J.

MIDDLE ATLANTIC

Pittsburgh Reflector Co.: Lewis A. Steinberg, sales engineer in Western Pennsylvania, Eastern Ohio, and Northern West Virginia, office in Pittsburgh.

General Dynamics Corp., Electro Dynamic Div.: Mark L. Lane, New York District Manager.

General Electric Co., Electronics Div.: Leroy L. Emmel, sales and application engineer for germanium products in New York City and surrounding metropolitan area, office in Clifton, N. J.

SOUTH ATLANTIC

National Electric Products Corp.: Robert O. Burke, district sales manager, Washington, D. C. office.

General Electric Co., Electronics Div.: Christian J. Goodman, sales and applications engineer for germanium products in Atlantic Coast states from New York to Florida.

EAST CENTRAL

Line Material Co.: Chicago Sales Office has moved to new quarters at



GEORGE A. TOMPKINS, chief electrical inspector of Grand Rapids, Michigan, brings contractors up to date on new NEC and local electrical code regulations at meeting of the Grand Rapids Electric Club.

4700 Lake Street, Melrose Park, Ill.
BullDog Electric Products Co.: Gordon P. Bowman, District Manager, Cincinnati Sales Office.

Fenwal Incorporated: H. T. Collins, branch manager of new district office at 549 W. Washington St., Rm. 704, Chicago, Ill.

General Electric Co., Electronics Div.: Harvey F. Hodson and Albert C. Oeinck, sales and applications engineers for germanium products in East Central states, office in Chicago.

Bryant Electric Co.: John R. Craig, Western district manager, Chicago; Edgar B. Gilmore, North Central area manager, Cincinnati.

WEST CENTRAL

Pittsburgh Reflector Co.: David B. Young, sales engineer in Louisiana and Southern Mississippi, office in New Orleans.

Bryant Electric Co.: Robert S. Hawkins, Southwestern area manager, office in Dallas, Texas.

General Electric Co., Electronics Div.: Vincent J. Huntoon, sales and applications engineer for germanium products in West Central states, office in Chicago.

WEST

Burndy Engineering Co., Inc.: J. O. Malvin, sales representative for Boise, Idaho area.

Sola Electric Co.: Richard S. Smith, district sales engineer, Los Angeles branch office for specialty transformer sales.

Electro Silv-A-King Corp.: A. R. Parker, district sales manager for northern half of California.

Line Material Co.: Los Angeles branch office has moved to new quarters at 6490 E. Fleet St.; H. M. Porter is branch manager of new sales office at 1333 N. W. 12th Ave., Portland, Oregon.



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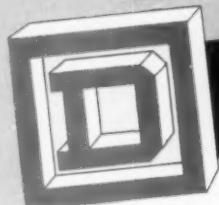
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